

CLIMATE CHANGE AND THE CALIFORNIA ENVIRONMENTAL QUALITY ACT

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I. INTRODUCTION

As anyone familiar with *Sports Illustrated*¹ or the Oscars, let alone the Intergovernmental Panel on Climate Change, now knows, anthropogenically-induced climate change² is a very big problem. Scientists predict that in California, upon which this article focuses, unchecked climate change would decimate water supplies, intensify heat waves, accelerate coastal erosion, degrade air quality, increase wildfires, and reduce wildlife habitat—among other impacts.³ Similar consequences are likely worldwide.⁴ Those impacts threaten to create major social and economic costs,⁵ and while climate change will affect almost everyone, the burdens for low-income or otherwise vulnerable communities will be particularly heavy.⁶

Those threats have led to intense academic and, increasingly, political interest in developing new legal mechanisms for addressing climate change. Such efforts are

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¹ See Alexander Wolff, *Going, Going Green*, SPORTS ILLUSTRATED, March 6, 2007, available at <http://sportsillustrated.cnn.com/2007/more/03/06/eco0312/index.html>.

² This memorandum refers to “climate change,” which encompasses both warming temperatures and changed storm and precipitation patterns, rather than using the narrower term “global warming.” In most popular discussions, however, the terms are used interchangeably.

³ See, e.g., CALIFORNIA CLIMATE CHANGE CENTER, OUR CHANGING CLIMATE: ASSESSING THE RISKS TO CALIFORNIA 2 (2006) (hereinafter “OUR CHANGING CLIMATE”); CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, CLIMATE ACTION TEAM REPORT TO GOVERNOR SCHWARZENEGGER AND THE LEGISLATURE 5 (2006) (“global warming will impose compelling and extraordinary impacts on California”).

⁴ INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS SUMMARY FOR POLICYMAKERS 12 (2007) (hereinafter IPCC, THE PHYSICAL SCIENCE BASIS) (describing some of the expected changes); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: CLIMATE CHANGE IMPACTS, ADAPTATION AND VULNERABILITY (2007) (hereinafter IPCC, IMPACTS, ADAPTATION, AND VULNERABILITY); *Massachusetts v. EPA*, 127 S. Ct. 1438, ___ (2007) (“The harms associated with climate change are serious and well recognized.”).

⁵ IPCC, IMPACTS, ADAPTATION, AND VULNERABILITY, *supra* note 3; see Cal. Health and Safety Code § 38501(a), (b); Anthony C. Fisher et al., *The Most Expensive Thing We Can Do Is Nothing: An Open Letter From California Economists*, August, 2006 (“California’s economy is vulnerable to climate change impacts, including changes in water availability, agricultural productivity, electricity demand, health stresses, environmental hazards, and sea level.”).

⁶ REDEFINING PROGRESS, CLIMATE CHANGE IN CALIFORNIA: HEALTH, ECONOMIC AND EQUITY IMPACTS (2006); IMPACTS, ADAPTATION, AND VULNERABILITY, *supra* note 3, at 19 (observing that factors like poverty can limit adaptive capacity).

essential, and nothing written here denigrates their importance, but the central thesis of this article is that existing provisions of some familiar old laws also can help. Narrowly, this article discusses one such law. It explains how the California Environmental Quality Act (CEQA),⁷ a somewhat typical environmental assessment statute,⁸ creates mandates and incentives for avoiding contributions to climate change.⁹ CEQA requires that California's state and local agencies identify and, if feasible, mitigate or avoid the significant adverse environmental impacts of projects they propose or approve.¹⁰ Climate change is a classic example of a cumulative environmental impact, and CEQA's mandates extend to requiring identification of contributions to such significant cumulative impacts.¹¹ And because mitigation of those contributions almost always will be feasible—between on and off-site measures, agencies should be able to avoid or fully offset emissions of the pollutants that cause climate change—CEQA effectively requires that the projects it regulates make climate change no worse.¹²

After an overview discussion of the causes of climate change, its impacts in California and elsewhere, and existing regulatory schemes for limiting climate change, the core sections of this article explain how CEQA applies to projects contributing to climate change. It then addresses a related normative question: does CEQA provide a good mechanism for responding to climate change? That question is not trivial; CEQA applies to thousands of projects, and California's contributions to climate change are by no means small. Nor is it parochial, for legal systems throughout the world include laws like CEQA,¹³ and this article's discussion could extend, albeit with some modification, to

⁷ Cal. Public Resources Code §§ 21000-21177.

⁸ Environmental assessment laws require evaluation of the environmental consequences of projects, alternatives to those projects, and ways that project impacts can be mitigated, before the project is approved. *See, e.g.*, 42 U.S.C. § 4332 (the National Environmental Policy Act).

⁹ CEQA also creates obligations for agencies to evaluate how climate change will affect the environmental context of their projects—for example, whether other environmental impacts will become more significant if superimposed upon the impacts of climate change, or whether climate change will increase the environmental risks created by a project—but that obligation is not the subject of this article.

¹⁰ *See* Cal. Public Resources Code § 21002. CEQA applies not only to government-sponsored projects, but also to private projects that require discretionary approvals from government agencies. *Friends of Mammoth v. Board of Supervisors*, 8 Cal. 3d 247 (1972).

¹¹ *See infra* Part ____.

¹² *See infra* Part ____.

¹³ *E.g.* 42 U.S.C. § 4332; Environmental Assessment, at <http://ec.europa.eu/environment/eia/home.htm> (describing environmental assessment requirements in the European Union); Canadian Environmental Assessment Agency, *Introduction and Features: Canadian Environmental Assessment Act*, at http://www.ceaa-acee.gc.ca/013/intro_e.htm#3 (last checked January 23,

laws in many other jurisdictions.¹⁴ The question also isn't rhetorical. Though the ubiquity of such environmental assessment laws attests to their popularity, their value has been vigorously contested, both in academic and political circles, since environmental assessment laws first emerged in the early 1970s.¹⁵ Disagreements about the wisdom of decentralized¹⁶ environmental enforcement mechanisms—upon which laws like CEQA largely rely—are similarly intense, particularly where those laws would address geographically extensive problems like climate change.¹⁷ CEQA thus exemplifies a potentially widespread but probably controversial method of addressing climate change.¹⁸

2007); WORLD BANK, OPERATIONAL MANUAL: ENVIRONMENTAL ASSESSMENT OP 4.01 P 1 (2004), available at <http://wbln0018.worldbank.org/Institutional/Manuals/OpManual.nsf/toc2/9367A2A9D9DAEED38525672C007D0972?OpenDocument>. See, e.g., State Environmental Protection Administration (China), *82 Projects Seriously Violating EIA Rules Blacklisted and EIA Approval of Construction Projects in Some Regions or Enterprises Suspended*, January 12, 2007, at http://english.sepa.gov.cn/zwxx/xwfb/200701/20070112_99526.htm ("The administration on Wednesday also exposed 82 projects that seriously violated state environment appraisal standards."); Environmental Assessment in Countries in Transition, *Legislation*, at <http://www.ceu.hu/envsci/eianetwork/legislation/index.html> (last checked January 23, 2007) (providing links to environmental assessment laws in former Soviet bloc countries).

¹⁴ See, e.g., Executive Office of Environmental Affairs, Commonwealth of Massachusetts, Greenhouse Gas Emissions Policy, April 23, 2007, available at <http://www.mass.gov/envir/mepa/pdffiles/misc/ghgemissionspolicy.pdf> (requiring discussion of GHG emissions in some reports prepared pursuant to the Massachusetts Environmental Policy Act).

¹⁵ Much of the debate has focused on NEPA rather than NEPA's state counterparts. See, e.g., Bradley C. Karkkainen, *Whither NEPA?*, 12 N.Y.U. ENVTL. L.J. 333, 338-43 (2004) (describing those debates); Robert W. Adler, *In Defense of NEPA: The Case of the Legacy Parkway*, 26 J. LAND RESOURCES & ENVTL. L. 297 (2006); Dinah Bear, *Some Modest Suggestions for Improving the National Environmental Policy Act*, 43 NAT. RESOURCES J. 931 (2003); Task Force on Improving the National Environmental Policy Act and Task Force on Updating the National Environmental Policy Act, Committee on Resources, United States House of Representatives, *Initial Findings and Recommendations*, December 21, 2005 (critiquing NEPA, and proposing changes; Professor Adler's article, cited *supra*, critiques the proposed revisions).

¹⁶ I use this term, rather than "citizen enforcement," because some CEQA suits are filed not by individual private citizens or citizens' groups but by professional environmental organizations or government agencies.

¹⁷ See, e.g., William W. Buzbee, *The Story of Laidlaw: Standing and Citizen Enforcement*, in ENVIRONMENTAL LAW STORIES (Richard J. Lazarus and Oliver A. Houck, eds. 2005) (describing those controversies as part of the backdrop for the Supreme Court's decision in *Friends of the Earth, Inc. v. Laidlaw Environmental Services (TOC), Inc.*, 528 U.S. 167 (2000)); Mark Seidenfeld and Jana Satz Nugent, *"The Friendship of the People": Citizen Participation in Environmental Enforcement*, 73 GEO. WASH. L. REV. 269 (2005) (providing a qualified endorsement); *Lujan v. Defenders of Wildlife*, 504 U.S. 555, 576 (1992) ("Vindicating the public interest... is the function of Congress and the Chief Executive."); *Mass. v. EPA*, 415 F.3d 50, 59-60 (2005), reversed, *Massachusetts v. EPA*, 127 S. Ct. 1438 (2007) (Sentelle, J. concurring) ("The generalized public good that petitioners seek is the thing of legislatures and presidents, not of courts.").

¹⁸ The controversy already has started. Environmental groups and the California Attorney General's office have been demanding that CEQA studies address climate change, and their demands

Although CEQA's model is not perfect, it is, I argue, very good; laws like CEQA can help address climate change. As decentralized, adaptable legal mechanisms, they can compel environmental improvements that would escape other regulatory approaches. And by allowing flexible—even market-friendly—compliance techniques, laws like CEQA can efficiently achieve those benefits. They are not comprehensive or cost-free solutions, and their presence does not obviate the need for complementary regulatory approaches. Nevertheless, they can contribute substantially, and with a problem as urgent and intractable as climate change, substantial contributions are much too important to pass up.

II. Climate Change Background

A. A Brief Overview of the Problem

In the 1970s and 1980s, climate scientists increasingly came to a troubling consensus.¹⁹ Carbon dioxide, which our fossil-fuel-based economy was pumping into the atmosphere in increasing quantities, creates a “greenhouse effect.”²⁰ While it lets light energy into the earth's atmosphere, CO₂ reduces the amount of reflected heat released.²¹ Other gases create similar effects, and some, like methane, have greenhouse properties substantially more intense than CO₂.²² Consequently, scientists predicted that as atmospheric levels of CO₂ and other greenhouse gases (GHGs) rose, the earth's climate would warm.

Those predictions have almost certainly proven accurate. Primarily because of fossil fuel combustion, atmospheric CO₂ levels have risen dramatically in recent decades, and are continuing to rise.²³ Global average temperatures also have been warming for

already have provoked multiple rounds of preliminary litigation, concern from the developers' bar, and an intense backlash from some industries and pro-development advocacy groups.

¹⁹ For a concise overview of several decades of climate change research, see Spencer Weart, *The Modern Temperature Trend* (2006), at <http://www.physicists.net/history/climate/20ctrend.htm>.

²⁰ See James E. Hansen, et al., *Climate Impact of Increasing Atmospheric Carbon Dioxide*, 213 SCIENCE 957-66 (1981).

²¹ See PEW CENTER FOR GLOBAL CLIMATE CHANGE, *THE CAUSES OF GLOBAL CLIMATE CHANGE* (2006).

²² See THE CALIFORNIA CLIMATE CHANGE CENTER AT UC BERKELEY, *MANAGING GREENHOUSE GAS EMISSIONS IN CALIFORNIA I-7* (2006) (hereinafter “MANAGING GREENHOUSE GAS EMISSIONS”) (describing the impacts of other GHGs).

²³ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 2 (“Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed preindustrial values...”); CALIFORNIA DEPARTMENT OF WATER RESOURCES, *PROGRESS ON INCORPORATING CLIMATE CHANGE INTO MANAGEMENT OF CALIFORNIA'S*

several decades, and while warming earlier in the twentieth century was probably natural, human activity appears to have caused the more recent rise.²⁴ There is no real scientific doubt that anthropogenic emissions will warm our climate even more if they continue unabated into the future.²⁵ The projected changes are substantial, with the Intergovernmental Panel on Climate Change predicting worldwide average temperature increases ranging from 1.1 to 6.4 degrees Fahrenheit (with the lower figure assuming efforts to minimize GHG emissions) by the end of the 21st century.²⁶

Those temperature increases will cause many major environmental changes, most of them undesirable.²⁷ Sea level rise threatens low-lying coastal areas with flooding and increases vulnerability to Katrina-like storms.²⁸ Extreme weather events, including droughts and floods, will almost certainly occur more frequently.²⁹ In combination with the loss of glaciers and summer snowpacks in mountain regions, droughts will increase water shortages, disrupting both natural systems and human economies.³⁰ Rising temperatures will warm waters and shift climate zones further north or further uphill, extinguishing those species that are unable to migrate, while facilitating the movement of some others—crop pests and disease vectors, for example—that most people would

WATER RESOURCES 2-12 (2006) (chart showing rising CO2 levels); *Massachusetts v. EPA*, 127 S. Ct. 1438, __ (2007) (describing the rise, and early governmental responses).

²⁴ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4; PEW CENTER FOR GLOBAL CLIMATE CHANGE, *supra* note 21, at 1, 2-5 (“During the twentieth century, the earth’s surface warmed by about 1.4 F.... Recent decades have seen record-high average global surface temperatures.”); *Massachusetts v. EPA*, 127 S. Ct. 1438, __ (2007) (“Respected scientists believe the two trends are related.”).

²⁵ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4; Naomi Oreskes, *Beyond the Ivory Tower: The Scientific Consensus on Climate Change*, 306 SCIENCE 1686 (2004) (“Politicians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect.”); DAN CAYAN ET AL. (CALIFORNIA CLIMATE CHANGE CENTER), *CLIMATE SCENARIOS FOR CALIFORNIA 1-2* (2006) (describing global and regional warming trends); *see id.* at 3 (“the winter and spring warming that has occurred in the California region over the last few decades is very unlikely to have been caused only by natural climate variations”).

²⁶ IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 11. The IPCC’s projections are based on a range of possible sociological/political/technological scenarios, some of which would involve higher emissions than others. *See also* DEPT. OF WATER RESOURCES, *supra* note 23, at 2-12 to 2-13 (describing older projections from the IPCC and others).

²⁷ See IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 3.

²⁸ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 11 (projecting sea level rises. The IPCC’s projections do not include the potential effects of changing ice flow in Greenland or Antarctica); IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 3, at 9.

²⁹ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 12 (“It is *very likely* that hot extremes, heat waves, and heavy precipitation events will continue to become more frequent.... It is likely that future tropical cyclones (typhoons and hurricanes) will become more intense.... There is less confidence in projections of a global decrease in numbers of tropical cyclones.”) (emphasis in original).

³⁰ IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 4, at 7-8.

prefer to avoid.³¹ Rising temperatures also can increase the frequency of extreme heat events like Europe's heat wave of 2003, which killed nearly 15,000 people in France alone.³² Not all of the changes will be negative; for example, scientists anticipate some increases in crop productivity.³³ But in general, most human and natural systems have attempted to adapt to the more stable climate of recent history, and a combination of changing environmental norms and increased variability will do more harm than good.³⁴

Because changes already are occurring, total prevention of anthropogenic climate change no longer is possible.³⁵ But climate change and the resulting negative impacts are not all-or-nothing phenomena; they can occur to greater or lesser degrees, and the damage therefore still may be limited.³⁶ Reduced GHG emissions will produce lower temperature increases,³⁷ which in turn should alleviate the severity of climate change's adverse consequences.³⁸ Similarly, increases at the middle of the projected range are less problematic than increases at the upper bound.³⁹ Taking steps to limit GHG emissions, and thus minimize climate change, therefore remains extremely important, and incremental solutions can offer far greater environmental benefits than no solutions at all.⁴⁰

³¹ *Id.* at 8 ("Approximately 20-30% of animal and plant species assessed so far are likely to be at increased risk of extinction if increases in global temperatures exceed 1.5 to 2.5 degrees C."), 9.

³² See United Nations Environment Program, *Impacts of Summer 2003 Heat Wave in Europe*, available at http://www.grid.unep.ch/product/publication/download/ew_heat_wave.en.pdf (last checked January 5, 2007) ("We cannot attribute this one event to climate change, but this type of occurrence is expected to happen more frequently."); IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 12.

³³ See IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 3.

³⁴ See *id.* (describing both positive and negative impacts).

³⁵ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4, at 4-9; AMY LYND LUERS AND SUSANNE C. MOSER, *PREPARING FOR THE IMPACTS OF CLIMATE CHANGE IN CALIFORNIA: OPPORTUNITIES AND CONSTRAINTS FOR ADAPTATION 3* (2006) ("climate change is demonstrably underway"); *id.* at 5 (table summarizing observed trends), 6; CLIMATE SCENARIOS FOR CALIFORNIA, *supra* note 25, at 1-2 (describing observed trends).

³⁶ See *Mass. v. EPA*, 127 S. Ct. 1438, __ (2007) (finding causation and redressibility because EPA's actions could reduce the problem, even if EPA cannot entirely resolve it).

³⁷ See CLIMATE SCENARIOS FOR CALIFORNIA, *supra* note 25, at 11 ("Regardless of which model is employed, the warming is greater for the higher-emission scenario than for the lower emission scenario.").

³⁸ See Katherine Hayhoe et al., *Emissions Pathways, Climate Change, and Impacts on California*, 101 PNAS 12422, 12427 (2004) (observing that impacts will occur regardless, but will be more severe with higher temperature increases); LUERS AND MOSER, *supra* note 35, at 3 ("the state's long-term ability to cope with climate impacts depends on the pace and magnitude of global climate change"); CAL. ENVTL. PROT. AGENCY, *supra* note 3, at 38 (table showing degrees of impact).

³⁹ See CAL. ENVTL. PROT. AGENCY, *supra* note 3, at 38 (table showing degrees of impact).

⁴⁰ See generally *Massachusetts v. EPA*, 127 S. Ct. 1438, __ (2007) (explaining the importance of incremental steps: "Agencies [] do not generally resolve massive problems in one fell regulatory swoop. They instead whittle away at them over time....") (internal citation omitted).

B. Climate Change and the State of California

While it derives from the aggregate effects of many local sources, climate change is in many ways a global problem. Unlike most air pollution problems, the location of GHG emissions matters little. GHGs generally are sufficiently long-lived to disperse throughout the atmosphere, and a ton of CO² emitted in California is therefore no more harmful to California than a ton of CO² emitted in Shanghai.⁴¹ The secondary environmental effects are similarly dispersed throughout the world; while some locations will feel climate change's impacts more than others, few areas are likely to be unaffected.⁴² And because the sources of climate change are also dispersed—no one country contributes a majority share of global GHG emissions—comprehensive solutions will likely require international cooperation.⁴³ Nevertheless, some areas play major roles in contributing to climate change, in some areas the effects will be especially pronounced, and some areas can make particularly important contributions to climate change prevention. California fits within each of those categories.

1. California's Contributions to Climate Change

California is a major contributor to global climate change. If it were an independent nation, California would be ranked (depending upon the study) as the tenth- to sixteenth-highest GHG-emitting nation in the world.⁴⁴ Indonesia, with a population of nearly 250 million people, emits similar GHG amounts, and California's emissions are on

⁴¹ See CALIFORNIA ENERGY COMMISSION, INVENTORY OF CALIFORNIA GREENHOUSE GAS EMISSIONS AND SINKS iii (2006) (hereinafter "INVENTORY") ("GHGs affect the entire planet, not just the location where they are emitted") (this report is labeled "draft staff report," but it represents the most current inventory, and this paper therefore relies upon it); IPCC, CLIMATE CHANGE 2001: THE PHYSICAL SCIENCE BASIS § 6.1.2, available at http://www.grida.no/climate/ipcc_tar/wg1/215.htm (explaining several of the primary GHGs, including carbon dioxide and methane, are "well-mixed gases," meaning that their long lifespan ensures homogenous mixing throughout the atmosphere); NATIONAL ACADEMY OF SCIENCES, CLIMATE CHANGE SCIENCE: AN ANALYSIS OF SOME KEY QUESTIONS (2001), available at <http://books.nap.edu/html/climatechange/3.html> ("If the average survival time for a gas in the atmosphere is a year or longer, then the winds have time to spread it throughout the lower atmosphere, and its absorption of terrestrial infrared radiation occurs at all latitudes and longitudes.").

⁴² See IPCC, THE PHYSICAL SCIENCE BASIS, *supra* note 4, at 12; IPCC, IMPACTS, ADAPTATION, AND VULNERABILITY, *supra* note 3 (describing worldwide and regional impacts).

⁴³ See INVENTORY, *supra* note 41, at 20 (2006) (showing worldwide emissions).

⁴⁴ The differences in emissions among the 10th through 19th-ranked nations are slight, meaning that a slight difference in calculations can create a seemingly large difference in rankings, and different reports rank California differently. Compare INVENTORY, *supra* note 41, at i, 20 (ranking California sixteenth; this report, while publicly available, is labeled a "draft staff report") with MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at I-6 ("Only nine nations have greater total emissions than the state."). The inventory's ranking of California's is also affected by its treatment of Texas, which emits substantially more GHGs than California, as a nation. See INVENTORY, *supra* note 41, at 20.

a par with those of France.⁴⁵ California's emissions exceed—by a wide margin—those of any other state except Texas.⁴⁶ And while California's per-capita GHG emissions are among the lowest in the nation, those emissions nevertheless have been growing. "From 1990 to 2004," according to the California Energy Commission, "total gross GHG emissions rose 14.3%."⁴⁷

Those emissions derive from a variety of sources. Transportation produces approximately 41% of California's total GHG emissions, with gasoline engines contributing the lion's share.⁴⁸ Electricity generation also contributes heavily, and out-of-state power, which more commonly derives from coal, disproportionately produces carbon dioxide emissions.⁴⁹ Industrial operations also contribute a large share, as do agriculture and forestry practices.⁵⁰ Fossil fuel combustion creates most of California's GHG emissions, but agricultural and landfill methane emissions and industrial releases of nitrous oxide and "high global warming potential" gases also add to the total output.⁵¹ Some agricultural activities and natural processes partly compensate for those emissions by removing GHGs from the atmosphere, but in the aggregate California's contributions heavily outweigh its sinks.⁵²

2. Climate Change's Effects Upon California

California also will be substantially harmed by climate change. Those harms are not unique; other states and countries will face similar threats, and in some places—particularly regions already more vulnerable to drought or flooding or already facing resource scarcity, or poorer and less stable countries where social and economic adaptation will likely prove more difficult—the consequences could be much more

⁴⁵ INVENTORY, *supra* note 41, at 20.

⁴⁶ *Id.* at i, 14.

⁴⁷ INVENTORY, *supra* note 41, at 8 ("California's GHG emissions are large and growing... they are expected to continue to increase in the future under 'business-as-usual' unless California implements programs to reduce emissions").

⁴⁸ *Id.* at ii, 9-10; see MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at I-7, I-10.

⁴⁹ INVENTORY, *supra* note 41 at ii-iii, 10, 11-12.

⁵⁰ *Id.* at ii, 10-11; see MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at I-7.

⁵¹ INVENTORY, *supra* note 41, at 6. The emitted amounts of these other GHGs are much smaller than the amount of CO₂ emitted, but these gases have far more powerful heat-trapping effects. See MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at I-7 (describing the greenhouse potential of sulfur hexafluoride).

⁵² See MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at I-10.

severe.⁵³ The difficulties facing California thus exemplify many of the worldwide threats posed by climate change, and are by no means outlying worst-case scenarios. But even if California alone were threatened, the likely adverse impacts still would be significant, and California's self-interest alone ought to prompt a vigorous response.

The litany of threats reads like the script of a bad disaster movie, and would seem too dire to believe were it not repeated in so many government and scientific reports. Average temperatures will likely rise significantly, particularly in inland areas,⁵⁴ leading to a long list of adverse consequences.⁵⁵ Air quality, which already is poor in much of California, will get worse.⁵⁶ Much precipitation that now falls as snow will in the future be rain, increasing winter flooding and reducing snowpacks and water supplies in summer, when California needs water most badly.⁵⁷ Cold-intolerant pests and pathogens

⁵³ See IPCC, IMPACTS, ADAPTATION, AND VULNERABILITY, *supra* note 3; Jeffrey Sachs, *Climate Change and War*, March 1, 2005, available at <http://www.globalpolicy.org/soecon/develop/africa/2005/0301sachs.htm> (connecting climate change and political conflict in sub-Saharan Africa); Julie Eilperin, *Military Sharpens Focus on Climate Change*, WASHINGTON POST, April 15, 2007, at A06 ("The U.S. military is increasingly focused on a potential national security threat: climate change.").

⁵⁴ OUR CHANGING CLIMATE, *supra* note 3, at 2 ("The latest projections, based on state-of-the-art climate models, indicate that if global heat-trapping emissions proceed at a medium to high rate, temperatures in California are expected to rise 4.7 to 10.5 degrees Fahrenheit by the end of the century.").

⁵⁵ *Id.* ("These temperature increases would have widespread consequences including substantial loss of snowpack, increased risk of large wildfires, and reductions in the quality and quantity of certain agricultural products."); see Hayhoe et al., *supra* note 38 (describing a similar set of impacts); Cal. Health & Safety Code § 38501(a) ("Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.").

⁵⁶ OUR CHANGING CLIMATE, *supra* note 3, at 5. The report states:

High temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, if temperatures rise to the medium warming range, there will be a 75 to 85 percent more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions.

⁵⁷ OUR CHANGING CLIMATE, *supra* note 3, at 6-7; Hayhoe et al., *supra* note 38, at 12425-46; DEPT. OF WATER RESOURCES, *supra* note 23, at 4-1 ("Planning and design of the Central Valley Project [] and State Water Project has, for the most part, assumed an unchanging climate... and a changing climate may threaten to destabilize the infrastructure and operations dependent on that assumption."). "If heat-trapping emissions continue unabated," the CCCC predicts, "more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent." OUR CHANGING CLIMATE, *supra* note 3, at 6; see CALIFORNIA DEPARTMENT OF WATER RESOURCES, CALIFORNIA WATER PLAN UPDATE 2005 4-32 to 4-36 (2006) ("Predictions include increased temperature, reductions to Sierra snowpack, earlier snowmelt, and a rise in sea level, although the extent and timing of the changes remain uncertain. The changes could have major implications for water supply,

may expand their ranges, damaging the state's agricultural economy and threatening human health.⁵⁸ Forest fires probably will occur more frequently.⁵⁹ Heat waves will become more frequent, extreme temperatures will be higher,⁶⁰ and those rising temperatures will degrade many terrestrial and aquatic ecosystems. Rising sea levels will increase flooding on the coast and in the Sacramento-San Joaquin Delta, accelerate erosion, and leave coastal construction increasingly vulnerable to storm damage.⁶¹ Those changes in turn will create major consequences not only for the state's environmental quality, but also for its economy; many of the state's most important industries are likely to be harmed.⁶²

flood management, and ecosystem health."); DEPT. OF WATER RESOURCES, *supra* note 23, at 2-6, 2-22 to 2-31. Specifically,

[d]ecreasing snowpack and spring stream flows coupled with increasing demand for water resulting from both a growing population and hotter climate could lead to increasing water shortages... late spring stream flows could decline by up to 30 percent. Agricultural areas could be hard hit, with California farmers losing as much as 25 percent of the water supply they need.

OUR CHANGING CLIMATE, *supra* note 3, at 7; see DEPT. OF WATER RESOURCES, *supra* note 23, at 4-15 to 4-16 (discussing preliminary model runs predicting "dead storage" conditions during drought years; "[o]ne would expect this shift in runoff will make it more difficult for the CVP and SWP to capture water and deliver it to their customers. The resulting annual average deliveries to Table A contractors listed in Table 4.14 fit these expectations for three of the four climate change scenarios."). Hydropower generation would be similarly impacted. While precipitation projections are "quite uncertain," the CCCC states that "if temperatures rise to the medium warming range and precipitation decreases by 10 to 20 percent, hydropower may be reduced by up to 30 percent." OUR CHANGING CLIMATE, *supra* note 1, at 7. Both floods and droughts also will tend to occur more often. REDEFINING PROGRESS, *supra* note 6, at 35.

⁵⁸ OUR CHANGING CLIMATE, *supra* note 3, at 9 ("[c]ontinued climate change will likely shift the ranges of existing invasive plants and weeds and alter competition patterns with native plants. Range expansion is expected in many species, while range contractions are less likely.... Continued climate change is likely to alter the abundance and types of many pests, lengthen pests' breeding season, and increase pathogen growth rates.").

⁵⁹ OUR CHANGING CLIMATE, *supra* note 3, at 10-11 (observing that global warming will exacerbate strains upon California's forests by "increasing the risk of wildfire and altering the distribution and character of natural vegetation"). Even in the "medium" range of predicted temperature rises, overall wildfire frequency is projected to increase by approximately 55%. If temperature increases are at the higher end of the range and precipitation levels drop, wildfire frequency in northern California, where most of the state's forests are located, could nearly double. *Id.*

⁶⁰ *Id.* at 5 ("As temperatures rise, Californians will face greater risk of death from dehydration, heat stroke/exhaustion, heart attack, stroke, and respiratory diseases caused by extreme heat. By mid century, extreme heat events in urban centers such as Sacramento, Los Angeles, and San Bernardino could cause two to three times more heat-related deaths than occur today."); see REDEFINING PROGRESS, *supra* note 6, at 19-26; Hayhoe et al., *supra* note 38, at 12424-45 ("heat-related mortality in Los Angeles is projected to increase by about two to three times under [a lower temperature increase scenario] and five to seven times under [a higher increase scenario] by the 2090s of acclimatization is taken into account").

⁶¹ DEPT. OF WATER RESOURCES, *supra* note 23, at 2-31 to 2-52.

⁶² See Cal. Health & Safety Code § 38501(b) ("Global warming will have detrimental effects on some of California's largest industries, including agriculture, wine, tourism, skiing, recreational and

Those problems would strike a state already struggling to cope with existing natural conditions. According to the California Climate Change Center,⁶³ “[t]he state’s vital resources and natural landscapes are already under stress due to California’s rapidly growing population, which is expected to grow from 35 million today to 55 million by 2050.”⁶⁴ Californians currently experience the nation’s worst air quality, with most of the state’s population living in areas with violations of federal and state air quality standards.⁶⁵ Water allocation is chronically contentious.⁶⁶ Past logging and fire suppression have degraded forests, leaving them dangerously fire-prone.⁶⁷ Other natural ecosystems are similarly strained, with dozens of plant and animal species threatened or endangered even under existing conditions.⁶⁸ Even without rising sea levels, the Sacramento-San Joaquin Bay-Delta, from which the state pumps much of its water

commercial fishing, and forestry. It will also increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the state.”)

⁶³ The California Climate Change Center is an academic research unit based primarily at the University of California’s Berkeley and San Diego campuses. Several of its reports have been sponsored by California state agencies. See OUR CHANGING CLIMATE, *supra* note 3, at 2.

⁶⁴ OUR CHANGING CLIMATE, *supra* note 3, at 2; see AMY LYND LUERS AND SUSANNE C. MOSER, PREPARING FOR THE IMPACTS OF CLIMATE CHANGE IN CALIFORNIA: OPPORTUNITIES AND CONSTRAINTS FOR ADAPTATION v (2006). Luers and Moser warn,

[t]oday’s climate variability and weather extremes already pose significant risks to California’s citizens, economy, and environment. They reveal the state’s vulnerability and existing challenges in dealing with the vagaries of climate. Continued climate changes, and the risk of abrupt or surprising shifts in climate, will further challenge the state’s ability to cope with climate-related stresses.

⁶⁵ OUR CHANGING CLIMATE, *supra* note 3, at 5. The report continues: more than 90 percent of the population liv[es] in areas that violate the state’s air quality standard for either ground-level ozone or airborne particulate matter. These pollutants can cause or aggravate a wide range of health problems including asthma and other acute respiratory and cardiovascular diseases, and can decrease lung function in children. Combined, ozone and particulate matter contribute to 8,800 deaths and \$71 billion in healthcare costs every year.

Id.

⁶⁶ See *id.* at 6-7 (describing California’s water resources as “already over-stretched by the demands of a growing economy and population”). CALIFORNIA WATER PLAN UPDATE 2005, *supra* note 57, at V.1 p. 3-7 (“environmental requirements are not always met”), V.1 p. 3-14 (estimating statewide groundwater overdraft at between one and two million acre-feet annually, though “the estimate is only tentative with no corroborating data”), V.2 p. 3-7 (“In dry years, California’s water supply is inadequate to meet its current level of use...”).

⁶⁷ See CALIFORNIA BOARD OF FORESTRY AND FIRE PROTECTION AND CALIFORNIA DEPARTMENT OF FORESTRY, CALIFORNIA FIRE PLAN 5-6 (1996) available at http://frap.cdf.ca.gov/fire_plan/ (“Deteriorating forest health, increasing fuel loads and other factors have led to more intense, destructive wildfires; unabated this pattern will continue.”); Carl T. Hall, *Raging Tahoe Fire’s Roots: 150 Years of Forest Abuse*, SAN FRANCISCO CHRONICLE, June 26, 2007, at A1.

⁶⁸ OUR CHANGING CLIMATE, *supra* note 3, at 10 (“The state’s burgeoning population and consequent impact on local landscapes is threatening much of this biological wealth.”).

supplies, already is severely vulnerable to flooding.⁶⁹ All of those environmental problems create institutional, economic, and political strains in addition to environmental and health costs; in California, litigious natural resource battles are ubiquitous.

While most Californians will be affected, the impacts of climate change are likely to be particularly harsh for the state's poorest and most vulnerable people, many of whom are people of color.⁷⁰ In part, disproportionate impacts will arise because adjusting to environmental change generally requires money and insurance, and poorer people by definition lack the former and are less likely to own the latter.⁷¹ Geography also will exacerbate distributional disparities. Some of the largest temperature increases are likely to occur in California's Central Valley,⁷² which already contains some of California's poorest areas, and poverty could increase as climate change disrupts the region's agricultural economy.⁷³ The Central Valley also is already one of California's hottest regions, and that heat contributes to some of the nation's worst air quality problems.⁷⁴ Consequently, some of the harshest impacts will fall upon California's most vulnerable people.

Though opposition to climate change regulation largely derives from fears of economic cost and disruption, California's economy actually may benefit substantially

⁶⁹ See, e.g., CALFED Bay-Delta Program, *Delta Levee Break Information*, at http://calwater.ca.gov/Levee_Break/DeltaLeveeBreakInfo.shtml (last checked Jan. 12, 2007).

⁷⁰ See REDEFINING PROGRESS, *supra* note 6. Internationally, similar disparities of impact are likely. See Ann E. Carlson, *Federalism, Preemption, and Greenhouse Gas Emissions*, 37 U.C. DAVIS L. REV. 281, 288 (2003) ("The largest producers of greenhouse gas emissions are not necessarily the countries that will suffer the most from global warming.").

⁷¹ See REDEFINING PROGRESS, *supra* note 6, at 16-19, 36-37. As the post-Katrina flooding starkly illustrated, those problems can be particularly intense when extreme weather events demand rapid adjustment. "Poor populations are less financially able to prepare for disaster, less likely to evacuate owing to lack of transportation, and less likely to relocate owing to lack of affordable housing alternatives." *Id.* at 57-58. Other effects of climate change, including economic disruption and increases in costs of basic necessities, such as household water or energy, also can intensify effects upon economically vulnerable groups. *Id.* at 63-64 ("The burden of rising prices affects low-income communities disproportionately because they spend more of their income on necessities than do high-income households.").

⁷² *Id.* at 9-10; see Hayhoe et al., *supra* note 38, at 12424 (showing maps of projected temperature increases).

⁷³ See *id.* at 3-4, 41-50 ("agriculture... is a significant source of employment for low-income groups and people of color. Shocks experienced by the industry could disproportionately affect these communities."); OUR CHANGING CLIMATE, *supra* note 3, at 8-9 (describing impacts to agriculture); Hayhoe et al., *supra* note 38, at 12426-27 (describing impacts to dairy and wine grape production).

⁷⁴ See REDEFINING PROGRESS, *supra* note 6, at 19-26 (describing disparities in vulnerability to heat waves), 26-35 (describing threats posed by increasing ozone (smog) pollution); Hayhoe et al., *supra* note 38, at 12425 ("Individuals most likely to be affected (by increases in extreme heat) include elderly, children, the economically disadvantaged, and those who are already ill.").

from responding to those problems, and not just through avoidance of costly environmental impacts. California's Environmental Protection Agency concludes that implementing climate change prevention strategies could *add* billions of dollars in additional income to the state economy.⁷⁵ Independent studies back those predictions; according to a recent California Climate Change Center report:

[g]lobally, increasing GHG emissions are assumed to be essential to a growing economy. This is not true in California. The state can take an historic step by demonstrating that reducing emissions of GHG can accelerate economic growth and bring new jobs.... California can gain a competitive advantage by acting early in the new technologies and industries that will come into existence worldwide around the common goal of reducing GHG emissions.⁷⁶

That message apparently has resonated with state lawmakers. According to the California Legislature, "[b]y exercising its global leadership role, California will also position its economy, technology centers, financial institutions, and businesses to benefit from national and international efforts to reduce emissions of greenhouse gases."⁷⁷ Governor Schwarzenegger likewise has asserted that "technologies that reduce greenhouse gas emissions are increasingly in demand in the worldwide marketplace, and California companies investing in these technologies are well-positioned to profit from this demand, thereby boosting California's economy, creating more jobs and providing increased tax revenue."⁷⁸

The environmental impacts of climate change thus pose a significant but redressible threat to California. With consequences likely to strike across much of California's landscape and throughout many sectors of California's economy, with harsh and costly potential impacts upon most Californians—particularly those already vulnerable to economic and environmental risk—and with potential collateral economic benefits from a vigorous response, climate change threatens damage well worth minimizing or preventing.

3. Existing Regulatory Responses to Climate Change

⁷⁵ CALIFORNIA ENVTL. PROT. AGENCY, *supra* note 3, at 65 (stating that implementing climate change prevention strategies could "increase jobs and income by an additional 83,000 and \$4 billion, respectively").

⁷⁶ MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at E-6.

⁷⁷ Cal. Health & Safety Code § 38501(e).

⁷⁸ Governor of the State of California, Executive Order S-3-05, June 1, 2005.

Despite the threats posed by climate change and the potential benefits of a vigorous response, federal action has been almost totally absent. The United States has neither ratified the Kyoto Protocol nor advanced any serious proposals for alternate international regulatory structures.⁷⁹ Domestic legislation has been similarly lacking; notwithstanding recent legislative proposals, Congress as of this writing has acted primarily to thwart efforts to address the problem.⁸⁰ Until rebuked by the Supreme Court, EPA declined to regulate carbon dioxide emissions, instead insisting it had no power to do so.⁸¹ And although the Bush Administration now acknowledges the reality of anthropogenically-caused climate change, it has placed its faith largely in voluntary responses.⁸²

Unlike the federal government, California's leaders have recognized climate change as a problem requiring a vigorous response, but the state's efforts still are in some ways only preliminary. The governor and the California legislature have taken several major steps, including the passage of legislation setting automotive emissions standards for greenhouse gases.⁸³ In 2005, Governor Schwarzenegger declared the climate change debate to be "over," and issued an executive order targeting ambitious reductions in the state's carbon emissions.⁸⁴ In accordance with Schwarzenegger Administration policy,

⁷⁹ See Carlson, *supra* note 70, at 288-90 (describing the Bush Administration's climate change policies).

⁸⁰ See Jonathan B. Wiener, *Something Borrowed for Something Blue: Legal Transplants and the Evolution of Global Environmental Law*, 27 *ECOLOGY L.Q.* 1295, 1329 (2001) (describing the Byrd-Hagel resolution opposing the Kyoto Protocol, which the Senate passed by a 95-0 vote); Carlson, *supra* note 70, at 290 (describing failed congressional efforts to address climate change).

⁸¹ See *Mass. v. EPA*, 127 S. Ct. 1438, __ (2007).

⁸² Kirsten H. Engel and Scott R. Saleska, *Subglobal Regulation of the Global Commons: The Case of Climate Change*, 32 *ECOLOGY L.Q.* 183, 186 (2005); see *MANAGING GREENHOUSE GAS EMISSIONS*, *supra* note 2222, at ES-4 ("While helpful, there is no evidence that voluntary measures provide sufficient incentives to attain the Governor's targets.").

⁸³ See Cal Health & Safety Code § 43018.5. The automotive industry almost immediately challenged that legislation. See *Cent. Valley Chrysler-Jeep Inc. v. Witherspoon*, 2005 U.S. Dist. LEXIS 26536 (E.D. Cal. 2005) (allowing environmental groups to intervene in the automakers' lawsuit); Christopher T. Giovino, *California's Global Warming Bill: Will Fuel Economy Preemption Curb California's Air Pollution Leadership?*, 30 *ECOLOGY L.Q.* 893 (2003) (describing likely challenges, and arguing that California should prevail); Carlson, *supra* note 70 (describing the legislation and likely challenges).

⁸⁴ See Bill Blakemore, *Schwarzenator v. Bush: Global Warming Debate Heats Up*, ABC NEWS, August 30, 2006, at <http://abcnews.go.com/US/GlobalWarming/story?id=2374968&page=1> ("I say the [global warming] debate is over. We know the science," Schwarzenegger declared forcefully at a recent United Nations summit. "We see the threat, and we know the time for action is now.") (brackets in original); Executive Order S-3-05, *supra* note 78. The order states, in part: "the following greenhouse gas emission reduction targets are hereby established for California: by 2010, reduce GHG emissions to 2000

many of California's administrative agencies are studying ways in which those agencies may respond to climate change.⁸⁵ The state attorney general's office has repeatedly attempted to compel responses to climate change, most notably by joining lawsuits seeking to impose nuisance liability on the electric power industry and to compel EPA to regulate automotive GHG emissions, and more recently by directly suing automakers.⁸⁶ Those efforts build upon earlier achievements. Because of past energy shortages and stringent air quality protections, California has implemented many measures designed to improve energy efficiency. Partly because of those measures, Californians' per capita GHG emissions now are lower than those of most Americans, even though their aggregate emissions are still growing.⁸⁷

Adding to those efforts, the California Legislature recently enacted and Governor Schwarzenegger signed into law AB 32, also known as the California Global Warming Solutions Act of 2006, a landmark statute designed to cap California's greenhouse gas emissions.⁸⁸ AB 32 requires the California Air Resources Board (CARB) to cap statewide emissions at 1990 levels.⁸⁹ It empowers the CARB to use a variety of regulatory mechanisms to achieve compliance with that cap by 2020, if not sooner.⁹⁰ AB 32 also requires establishment of a monitoring and enforcement system for tracking and regulating GHG emissions, and empowers the CARB to take immediate steps to limit

levels; by 2020, reduce GHG emissions to 1990 levels; by 2050, reduce GHG emissions to 80% below 1990 levels...."

⁸⁵ *E.g.* DEPT. OF WATER RESOURCES, *supra* note 23. The efforts haven't been uniform; the governor's office recently proposed steep cuts in public transit budgets, and many state agencies have proven exceedingly reluctant to actually do something about their own contributions. *See Rachel Gordon, Governor's Budget Plan Diverts Millions from Public Transit*, SAN FRANCISCO CHRONICLE, May 16, 2007, at B1. DWR, for example, uses extraordinary amounts of energy pumping water to southern California, but has fought tooth and nail against any proposal that it ought to consider limiting such pumping.

⁸⁶ *Conn. v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265 (S.D.N.Y. 2005) (dismissing that nuisance case); *Mass. v. EPA*, 127 S. Ct. 1438, __ (2007); Nick Bunkley, *California Sues 6 Automakers Over Global Warming*, NEW YORK TIMES, September 21, 2006.

⁸⁷ *See INVENTORY*, *supra* note 41 at i, 12 ("California's ability to slow the rate of growth of GHG emissions is largely due to the success of its energy efficiency and renewable energy programs and a commitment to clean air and clean energy.... Although California's total GHG emissions are larger than every state but Texas, California has relatively low carbon emission intensity. In 2001, California ranked fourth lowest of the 50 states in carbon dioxide emissions per capita from fossil fuel consumption and fifth lowest of the 50 states in carbon dioxide emissions per unit of gross state product.").

⁸⁸ California Climate Change Solutions Act of 2006, A.B. 32, 2005-06 Sess., *codified at Cal. Health & Safety Code* §§ 38500-99.

⁸⁹ *Cal. Health & Safety Code* §§ 38550-38551.

⁹⁰ *Cal. Health & Safety Code* §§ 38560-38565.

high-emitting sources.⁹¹ The Legislature left most other details to the agency's discretion; while the CARB must avoid environmental injustice in implementing its measures, its program will take shape primarily through rulemaking processes.⁹²

Passing AB 32 was a major step.⁹³ No other state has a law like it,⁹⁴ and the federal government has shown little initiative toward passing anything nearly so ambitious.⁹⁵ Nevertheless, and as discussed more fully in Part ___, its enactment is only a start. CARB's regulatory program has not yet taken shape, and no one yet knows how effective it will be, or to what extent AB 32 will join a long list of environmental statutes that fail to ensure full achievement of their stated goals.⁹⁶ Neither AB 32 nor any other state statute purports to occupy the regulatory field,⁹⁷ and both the need and the opportunity for complementary approaches therefore remain. As the next section discussed, CEQA provides such a complementary approach.⁹⁸

⁹¹ Cal. Health & Safety Code § 38530. That provision already has proved controversial. Two CARB officials recently were fired, and claimed that their firing resulted from conflicts over efforts by the Schwarzenegger administration to slow implementation of AB 32. *Air Board Officials Blame Schwarzenegger for Weakening Smog Regs*, SAN FRANCISCO CHRONICLE, June 30, 2007.

⁹² See Cal. Health & Safety Code §§ 38560-38574.

⁹³ See, e.g., Janet Wilson and Richard Simon, *Feinstein, Boxer Differ on Global Warming*, LOS ANGELES TIMES, January 18, 2007 (quoting California Assembly Speaker Fabian Nunez: "It's attracted worldwide attention, and it's landmark legislation"); *Editorial: Fueling the Future*, SACRAMENTO BEE, January 15, 2004, at A4 ("The signing of Assembly Bill 32—California's landmark global warming law—brought loads of publicity to Gov. Arnold Schwarzenegger last year.").

⁹⁴ Other states and cities have taken important first steps toward addressing climate change, however, such as creating greenhouse gas registries or developing cap-and-trade programs applicable to limited sectors. See Engel and Saleska, *supra* note 82, at 216-22 (describing various types of local measures); Kirsten H. Engel, *Mitigating Global Climate Change in the United States: A Regional Approach*, 14 N.Y.U. ENVTL. L. J. 54, 65-66 (2005) (describing the "Regional Greenhouse Gas Initiative," an effort led by several northeastern states).

⁹⁵ See Carlson, *supra* note 70, at 288-90 (describing federal responses). Following the November 2006 elections, several proposed climate change bills are likely to move, but chances of passage of effective regulation seem slim so long as President Bush holds a veto. See Wilson and Simon, *supra* note 93 (describing proposed bills by Senators Feinstein and Boxer).

⁹⁶ See *infra* Part ___ (describing the reasons why statutes don't achieve their stated goals); *Arnie's Uphill Climb*, THE ECONOMIST, June 23, 2007, at 36 (describing the challenges of implementing climate change legislation).

⁹⁷ See Cal. Health and Safety Code §§ 38592(b), 38598.

⁹⁸ That CEQA establishes obligations does not mean, of course, that agencies are fulfilling, or even acknowledging, those obligations. Without judicial enforcement—and as of yet there are no published decisions either enforcing or rejecting CEQA's applicability to climate change contributions—climate change analysis and mitigation is unlikely to become prevalent.

Discerning the reasons for that absence of cases is inherently somewhat speculative, but one likely reason is that until recently, plaintiffs could not count on a court accepting climate change as reality. Though the scientific consensus is now nearing middle age, governmental consensus on the reality of climate change is fairly new; and the absence of such consensus would have deterred potential plaintiffs.

III. EXPLAINING THE OBLIGATION: HOW CEQA ADDRESSES CLIMATE CHANGE

A. CEQA's Requirements

Like the National Environmental Policy Act, which has been hailed as an environmental "Magna Carta,"⁹⁹ CEQA's opening text foreshadows grand intentions. The Legislature's declaration of purposes asserts that environmental considerations must play a central role in state and local agency decision-making.¹⁰⁰ Unlike NEPA, CEQA's broad purposes have informed the holdings of a supreme court; the state's high court has repeatedly directed that "CEQA is to be interpreted 'to afford the fullest possible protection to the environment within the reasonable scope of the statutory language.'"¹⁰¹

CEQA promotes such protection primarily through a few basic requirements, most readily recognizable to anyone familiar with environmental assessment laws. Any

Compare Oreskes, *supra* note 25 (describing the consensus that human activity is making major contributions to climate change), with *Massachusetts v. Environmental Protection Agency*, Oral Argument Transcript, November 29, 2006, at 5 (question of Justice Scalia: "[w]ell, there's a lot of conjecture about whether—I gather that there's something of a consensus on warming, but not a consensus on how much of that is attributable to human activity."). In the dissenting opinion, vestiges of doubt remain; Judge Roberts dismissed as "conclusory" Massachusetts' un rebutted, and scientifically non-controversial, contention that sea level rise would take away state land. *Mass. v. EPA*, 127 S. Ct. 1438, __ (2007)

With increasing acknowledgment of the reality of climate change, however, cases cropping up. *See, e.g.*, Jason W. Armstrong, *Development in the Age of Climate Change: Lawsuit Challenges Housing Plan That Does Not Gauge Fossil Fuel Impacts*, DAILY JOURNAL, December 21, 2006 (describing a lawsuit filed by the Center for Biological Diversity); Edward Humes, *Showdown at Tejon Ranch*, CALIFORNIA LAWYER, June, 2007, at 20; *Friends of the Earth v. Watson*, 2005 U.S. Dist. Lexis 42335 (N.D. Cal. 2005) (granting standing in a similar claim filed under NEPA). Plaintiffs also increasingly are demanding that agencies consider climate change when assessing the environmental context of, and risks to, projects they propose—a separate issue not addressed in this article. *See, e.g.*, Dennis Pfaff, *Lawsuits Over the Effects of Climate Change Become New Legal Front in Development Wars*, THE LEGAL RECORDER, November 24, 2006, at 1-2 (describing litigation over development projects proposed for below-sea-level islands in the Sacramento-San Joaquin Delta).

⁹⁹ RICHARD J. LAZARUS, *THE MAKING OF ENVIRONMENTAL LAW* 68 (2004)

¹⁰⁰ Cal. Pub. Res. Code §§ 21000(d), 21001(a), (d) (stating that agencies shall "[d]evelop and maintain a high quality environment now and in the future, and take all action necessary to protect, rehabilitate, and enhance the environmental quality of the state;" "take all coordinated actions necessary to prevent [critical environmental] thresholds being reached;" and "[e]nsure that the long-term protection of the environment, consistent with the provision of a decent home and suitable living environment for every Californian, shall be the guiding criterion in public decisions").

¹⁰¹ *Mountain Lion Foundation*, 16 Cal.4th at 112 (quoting *Friends of Mammoth v. Board of Supervisors*, 8 Cal. 3d 247, 259 (1972)); *Laurel Heights Improvement Ass'n v. Regents of the Univ. of Cal.*, 47 Cal.3d 376, 390 (1988). The California Supreme Court also has resolved cases in favor of environmental petitioners with far greater frequency than the U.S. Supreme Court, where no NEPA petitioner ever has won. *See* Jason Czarnecki, *Revisiting the Tense Relationship Between the U.S. Supreme Court, Administrative Procedure, and the National Environmental Policy Act*, 25 *Stanford Envtl. L.J.* 3, 10 (2006); David C. Shilton, *Is the Supreme Court Hostile to NEPA? Some Possible Explanations for a 12-0 Record*, 20 *ENVTL. L.* 551 (1990).

time a state or local public agency makes a discretionary decision¹⁰² to approve or carry out a project with potentially significant environmental impacts—even if the project will be implemented by private parties¹⁰³—the agency must disclose any potentially significant adverse environmental consequences of its decision.¹⁰⁴ It then must identify and discuss measures capable of reducing or avoiding those adverse environmental impacts.¹⁰⁵ CEQA also imposes a substantive constraint absent from NEPA: if mitigation or avoidance measures can feasibly reduce significant adverse impacts, the lead agency must adopt those measures, and if feasible measures aren't available, the agency must provide findings justifying any decision to proceed with the project.¹⁰⁶ The discussion below explains those requirements in more detail.

1. Disclosure of Significant Adverse Environmental Impacts

If a proposed project¹⁰⁷ may¹⁰⁸ cause significant adverse impacts upon the environment, CEQA requires the lead agency¹⁰⁹ to either: (a) adopt or require project

¹⁰² See Cal. Pub. Res. Code § 21080(a); *Friends of Westwood v. City of Los Angeles*, 191 Cal. App. 3d 259, 267 (1987) (holding that the existence of any discretion in an approval process triggers CEQA's applicability).

¹⁰³ See *Friends of Mammoth v. Bd. of Supervisors*, 8 Cal. 3d 247 (1972) (holding that CEQA applies to private projects receiving governmental approvals).

¹⁰⁴ CEQA does set forth certain classes of projects that are categorically exempt from statutory requirements. E.g. Cal. Pub. Res. Code §§ 21080(b), 21080.14 (creating an exemption for "affordable housing projects in urbanized areas").

¹⁰⁵ *Sierra Club v. State Bd. of Forestry*, 7 Cal.4th 1215, 1233 (1994).

¹⁰⁶ See Cal. Pub. Res. Code § 21081. In practice, this difference between the statutes may not be quite so dramatic as it seems. Though NEPA in theory imposes no such substantive constraint, agencies often will implement mitigation measures to avoid the procedural cost of EIS preparation, and thus the outcomes mandated by CEQA sometimes will occur without an explicit substantive obligation. See Bradley C. Karkkainen, *Toward a Smarter NEPA: Monitoring and Managing the Government's Environmental Performance*, 102 COLUM. L. REV. 903, 932-37 (2002) (describing the prevalent use of the mitigated finding of no significant impact). And while NEPA may sometimes function as though it has a substantive element, CEQA sometimes seems to function as though it lacks one; compliance with CEQA's substantive mandate is generally reviewed under an abuse-of-discretion standard, creating a heavy evidentiary burden for plaintiffs challenging alleged substantive non-compliance. See *City of Marina v. Bd. of Trustees of Cal. State Univ.*, 39 Cal. 4th 341, 368 (2006) ("an agency's decision that the specific benefits a project offers outweigh any environmental effects that cannot feasibly be mitigated, while subject to review for abuse of discretion [], lies at the core of the lead agency's discretionary responsibility under CEQA and is, for that reason, not lightly to be overturned").

¹⁰⁷ See 14 Cal. Code Regs. § 15002(b) (explaining the types of actions to which CEQA applies).

¹⁰⁸ CEQA sets a fairly precautionary standard for requiring EIR preparation. "[A] public agency must prepare an EIR whenever substantial evidence supports a fair argument that a proposed project 'may have a significant effect on the environment.'" *Laurel Heights Improvement Assn. v. Regents of University of California*, 6 Cal. 4th 1112, 1123 (1993). Perhaps partly because of that precautionary standard, California agencies are more likely to prepare full environmental studies than their federal counterparts. While Professor Karkkainen observes that the ratio of FONSI to EISs is at least 100:1, the ratio of negative declarations to EIRs is closer to 5:1. Compare Karkkainen, *supra* note 106, at 920, with

changes that will avoid or fully mitigate potentially significant impacts;¹¹⁰ or (b) prepare an “environmental impact report” (EIR) before approving or carrying out the project.¹¹¹ The EIR, if prepared, must identify and discuss the project’s potentially significant adverse environmental impacts.¹¹²

CEQA defines “significant impacts” broadly and inclusively. Its definition includes—and agencies therefore must discuss—not only the direct environmental consequences of implementing the project, but also indirect effects following from direct physical consequences.¹¹³ That discussion should not be speculative,¹¹⁴ but where an indirect consequence is foreseeable, the existence of a causal chain between project and impact does not excuse the agency from discussing that impact.¹¹⁵

A lead agency also must address significant “cumulative” environmental impacts—that is, contributions, even if small, to larger environmental problems. CEQA defines a “significant effect on the environment” as including

possible effects of a project (that) are individually limited but cumulatively considerable. As used in this paragraph, ‘cumulatively considerable’ means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past

California Office of Planning and Research, Environmental Document Filings with the State Clearinghouse, 1999 to 2005, *available at* http://www.opr.ca.gov/clearinghouse/PDFs/1999-2005_All_Document_Filings.pdf.

¹⁰⁹ CEQA defines a “lead agency” as “the public agency which has the principal responsibility for carrying out or approving a project which may have a significant effect upon the environment.” Cal. Pub. Resources Code § 21067.

¹¹⁰ 14 Cal. Code Regs. §§ 15064, 15065(b)(1) (“Where, prior to the commencement of preliminary review of an environmental document, a project proponent agrees to mitigation measures or project modifications that would avoid any significant effect on the environment specified by subdivision (a) or would mitigate the significant effect to a point where clearly no significant effect on the environment would occur, a lead agency need not prepare an environmental impact report solely because, without mitigation, the environmental effects at issue would have been significant.”).

¹¹¹ See *Friends of Davis v. City of Davis*, 83 Cal. App. 4th 1004, 1016-17 (2000) (“An EIR is required whenever it can be ‘fairly argued on the basis of substantial evidence that the project may have significant environmental impact.’”) (citations omitted).

¹¹² See *Sierra Club*, 7 Cal. 4th at 1229 (describing an EIR as “an environmental alarm bell” and a “document of accountability”).

¹¹³ See 14 Cal. Code Regs. § 15064(d)(2) (“An indirect physical change in the environment is a physical change in the environment which is not immediately related to the project, but which is caused indirectly by the project”). See also 14 Cal. Code Regs. § 15358.

¹¹⁴ See *Planning & Conservation League v. Department of Water Resources*, 83 Cal. App. 4th 892, 919 (2000) (“We need not venture into speculation. But CEQA does compel reasonable forecasting.”).

¹¹⁵ See 14 Cal. Code Regs. § 15064(d)(2).

projects, the effects of other current projects, and the effects of probable future projects.¹¹⁶

Contributions to such cumulatively significant effects can trigger the obligation to prepare an EIR, for an agency must prepare an EIR if its "project has possible environmental effects that are individually limited but cumulatively considerable."¹¹⁷

The EIR then must disclose those cumulative impacts; agencies are obligated to "discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable."¹¹⁸

Judicial enforcement of those mandates has been fairly rigorous. California's courts have repeatedly emphasized the importance of cumulative impacts analyses, cautioning that "[o]ne of the most important environmental lessons is that environmental damage often occurs incrementally from a variety of small sources. These sources appear insignificant when considered individually, but assume threatening dimensions when considered collectively with other sources with which they interact."¹¹⁹ The courts therefore have required agencies to treat projects' contributions to larger environmental problems as significant, even where the individual project contribution would seem small in isolation.¹²⁰ They also have rejected a regulatory *de minimis* exemption from that

¹¹⁶ Public Resources Code § 21083(b)(2). The CEQA Guidelines similarly state that "[c]umulative impacts' refer to two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts." 14 Cal. Code Regs. § 15355. "While section 21083 governs the situations in which an agency must prepare an EIR, its provisions have also been applied to the contents of an EIR once it is determined an EIR must be prepared." *Los Angeles Unified School Dist.*, 58 Cal. App. 4th at 1024 n.6 (citing *Laurel Heights Improvement Ass'n*, 47 Cal.3d at 394).

¹¹⁷ 14 Cal. Code Regs. § 15065 (a)(3).

¹¹⁸ 14 Cal. Code Regs. § 15130(a); see *Los Angeles Unified School Dist.*, 58 Cal. App. 4th at 1024-26 (1997); *San Franciscans for Reasonable Growth v. City & County of San Francisco*, 151 Cal. App. 3d 61, 73 (1984) ("Part of [CEQA's] vital informational function is performed by a cumulative impact analysis.").

¹¹⁹ *Communities for a Better Environment v. California Resources Agency*, 103 Cal. App. 4th 98, 114 (2002); see *Bakersfield Citizens for Local Control v. City of Bakersfield*, 124 Cal. App. 4th 1184, 1214 (2005) (quoting *Communities for a Better Environment*); *Los Angeles Unified School Dist.*, 58 Cal. App. 4th at 1025; *San Joaquin Raptor/Wildlife Rescue Ctr. v. County of Stanislaus*, 27 Cal. App. 4th 713, 739 (1996); *Las Virgenes Homeowners Federation, Inc. v. County of Los Angeles*, 177 Cal. App. 3d 300, 306 (1986); *Whitman v. Board of Supervisors*, 88 Cal. App. 3d 397, 408 (1979).

¹²⁰ E.g. *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 718-24 (1990) (rejecting an EIR that failed to consider whether project emissions, in combination with emissions from other sources throughout the San Joaquin Valley, would create a significant impact); *Los Angeles Unified School Dist.*, 58 Cal. App. 4th at 1025 ("the relevant issue to be addressed in the EIR on the plan is not the relative amount of traffic noise resulting from the project when compared to existing traffic noise, but

general rule, reasoning that such an exemption would contravene the core purposes of a cumulative impacts analysis.¹²¹ Some debate remains about where exactly the lower bound of a cumulatively significant contribution lies; though the rejection of a *de minimis* exception implies that even tiny contributions can matter, the same court criticized a “one-molecule” standard for air pollution.¹²² But past decisions leave little doubt that CEQA’s full suite of obligations can be triggered even by a seemingly small contribution to a larger problem.

CEQA’s definition of significant impacts also includes impacts extending beyond California’s borders. While CEQA governs only decisions made and conduct occurring within California, nothing in its definition of significant impact allows agencies to ignore impacts outside state lines. Instead, “CEQA requires a public agency to mitigate or avoid its projects’ significant effects not just on the agency’s own property but ‘on the environment,’ with ‘environment’ defined for these purposes as ‘the physical conditions which exist within the area which will be affected by a proposed project.’”¹²³ That functional definition invokes no political boundaries; if an area is affected, it is part of the relevant physical environment.

2. Identification of Alternatives and Mitigation Measures

In addition to requiring identification of significant environmental impacts, CEQA also requires agencies to discuss ways in which those impacts can be reduced or avoided. Agencies must “systematically identif[y]... feasible alternatives or feasible mitigation measures which will avoid or substantially lessen [a project’s] significant

whether any additional amount of traffic noise should be considered significant in light of the serious nature of the traffic noise problem already existing around the schools”);

¹²¹ *Communities for a Better Environment*, 103 Cal. App. 4th at 116–21 (following *Kings County*, which it described as “[t]he seminal decision,” and *Los Angeles Unified School District*). *Communities for a Better Environment* invalidated a “de minimis” exception, which the Resource Agency had set forth in its regulations, and also rejected a theory that would have focused on the percentage contribution made by an individual project rather than on the overall scale of the project. That theory, the court observed, “contravene[d] the very concept of cumulative impacts,” for it ran counter to the basic principle that “the greater the existing environmental problems are, the lower the threshold should be for treating a project’s contribution to cumulative impacts as significant.” 103 Cal. App. 4th at 120; see *Grand Canyon Trust v. FAA*, 290 F.3d 339, 343 (D.C. Cir. 2002) (noting that when an environment is vulnerable, any additional impact “can be the straw that breaks the back of the environmental camel”).

¹²² *Communities for a Better Environment*, 103 Cal. App. 4th at 120

¹²³ *American Canyon Community United for Responsible Growth v. City of American Canyon*, 145 Cal. App. 4th 1062, 1082 (2006) (italics removed; quoting Cal. Pub. Res. Code § 21002.1(b) and *City of Marina v. Board of Trustees of California State University*, 39 Cal. 4th 341, 359–60 (2006)); 14 Cal. Code Regs. § 15360.

effects.”¹²⁴ That discussion of alternatives and mitigation measures forms the “core” of an EIR.¹²⁵

By requiring analysis of alternatives, CEQA compels agencies to consider whether different versions of the project, or even different projects, could accomplish most of the basic project purposes while reducing environmental costs.¹²⁶ Courts have repeatedly stated that agencies “must describe all reasonable alternatives to the project including those capable of reducing or eliminating environmental effects.”¹²⁷ No universally-applicable list sets forth the alternatives agencies must consider—the scope of the analysis instead is governed by project-specific circumstances, the standards set forth in the statute and the California Resources Agency’s CEQA guidelines, and a “rule of reason”¹²⁸—but agencies often consider building in alternative locations,¹²⁹ using different infrastructure to accomplish project purposes,¹³⁰ or scaling back a project’s scope.¹³¹

CEQA also requires discussion of mitigation measures.¹³² The CEQA Guidelines describe several categories of mitigation measures, including “avoiding the impact altogether by not taking a certain action or parts of an action”; restoring the environment impacted by the action; altering project operations to minimize the impact; or “[c]ompensating for the impact by replacing or providing substitute resources or

¹²⁴ Cal. Pub. Res. Code § 21002; *see* Cal. Pub. Resources Code § 21061 (stating that an EIR must “list ways in which the significant effects of such a project might be minimized” and “indicate alternatives to such a project.”).

¹²⁵ *Citizens of Goleta Valley v. Board of Supervisors*, 52 Cal.3d 553, 564 (1990).

¹²⁶ *See* 14 Cal. Code Regs. § 15126.6.

¹²⁷ *County of Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 203 (1977); *see* *Wildlife Alive v. Chickering*, 18 Cal.3d 190, 197 (1976); *Laurel Heights Improvement Assoc. v. Regents of Univ. of Calif.*, 47 Cal. 3d 376, 400 (1988); 14 Cal. Code Regs. § 15126.6.

¹²⁸ *See* 14 Cal. Code Regs. § 15126.6; *Citizens of Goleta Valley*, 52 Cal.3d at 565.

¹²⁹ *E.g. Citizens of Goleta Valley*, 52 Cal.3d at 570-75 (concluding that evaluation of a single off-site alternative was adequate); *San Bernardino Valley Audubon Society, Inc. v. County of San Bernardino*, 155 Cal.App.3d 738, 751 (1984) (rejecting an EIR that considered to narrow a range of site alternatives).

¹³⁰ *E.g. County of Inyo*, 71 Cal. App. 3d 185, 203 (1977) (rejecting an EIR for a water-delivery project that failed to consider conservation as an alternative to increased pumping); *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 730-37 (1990) (rejecting an EIR that considered a natural gas-burning alternative to a coal-fired power plant, but did not provide enough quantitative data to facilitate an effective comparative analysis).

¹³¹ *E.g. Village of Laguna Beach v. Board of Supervisors*, 134 Cal. App. 3d 1022, 1028-32 (1982) (upholding an EIR that considered a range of sizes for a proposed residential development).

¹³² *Save Our Peninsula Committee v. Monterey County Bd. of Supervisors*, 87 Cal. App. 4th 99, 139 (2001) (citing Cal. Public Resources Code §§ 21100, 21002.1, and 21061); *see* 14 Cal. Code Regs. § 15002(a)(2) (stating that one of CEQA’s “basic purposes” is to “[i]dentify ways that environmental damage can be avoided or significantly reduced”).

environments.”¹³³ They also specify that “where relevant,” EIRs must describe mitigation measures capable of reducing “inefficient and unnecessary consumption of energy.”¹³⁴

C. Adoption, if Feasible, of Alternatives or Mitigation Measures Capable of Avoiding Significant Environmental Impacts¹³⁵

While the obligations described above will seem familiar to any NEPA practitioner, CEQA adds a substantive twist: the statute expressly precludes agencies from adopting projects without also adopting feasible mitigation measures or alternatives capable of reducing significant adverse environmental impacts.¹³⁶ CEQA, in other words, contains the unequivocal substantive constraints for which many NEPA critics have long pined.¹³⁷ “[N]o public agency shall approve or carry out a project,” the statute directs, if “one or more significant effects on the environment [] would occur if the project is approved or carried out,” unless the public agency formally finds either: (a) that the impacts will be mitigated to a less-than-significant level; or (b) that such mitigation is infeasible, but project benefits still justify proceeding.¹³⁸ The CEQA Guidelines repeat that mandate, stating that the “basic purposes of CEQA” include “[p]revent[ing] significant, avoidable damage to the environment by requiring changes in projects

¹³³ 14 Cal. Code Regs. § 15370. At the boundaries, the difference between an alternative and a mitigation measure may be fuzzy, but generally speaking, mitigation measures involve revisions within the same project, while alternatives involve fundamentally different versions of the project. See *Laurel Heights*, 47 Cal.3d at 403 (“alternatives are a type of mitigation”).

¹³⁴ 14 Cal. Code Regs. § 15126.4; CEQA Guidelines App. F, available at http://www.ceres.ca.gov/topic/env_law/ceqa/guidelines/Appendix_F.html (last checked June 11, 2007).

¹³⁵ CEQA’s requirements for disclosure of significant impacts and analysis of alternatives and mitigation measures are little different from the requirements of the National Environmental Policy Act, and NEPA thus creates similar obligations to address climate change impacts. See 42 U.S.C. § 4332. However, unlike NEPA, which the Supreme Court has held is purely procedural, see *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 350-51 (1989), CEQA also contains a robust substantive component.

¹³⁶ *Mountain Lion Foundation v. Fish and Game Commission*, 16 Cal.4th 105, 134 (1997); see *Sierra Club v. State Bd. of Forestry*, 7 Cal.4th 1215, 1233 (1994) (“CEQA compels government first to identify the [significant] environmental effects of projects, and then to mitigate those adverse effects through the imposition of feasible mitigation measures or through the selection of feasible alternatives.”); *Sierra Club v. Gilroy City Council*, 222 Cal.App.3d 30, 41 (1990) (CEQA “requires public agencies to deny approval of a project with significant adverse effects when feasible alternatives or feasible mitigation measures can substantially lessen such effects”).

¹³⁷ See, e.g., Nicholas C. Yost, *NEPA’s Promise—Partly Fulfilled*, 20 ENVTL. L. 533 (1990) (arguing that the U.S. Supreme Court has gutted NEPA of its substantive requirements); William H. Rodgers, Jr., *NEPA at Twenty: Mimicry and Recruitment in Environmental Law*, 20 ENVTL. L. 485, 500-01 (1990).

¹³⁸ Cal. Pub. Res. Code § 21081.

through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.”¹³⁹ Thus, if mitigation or avoidance of a project’s significant adverse impacts is feasible, an agency cannot approve the project without adoption of those mitigation or avoidance measures.

Those provisions require mitigation of contributions to cumulatively significant impacts. A cumulatively significant impact is, by definition, a significant project impact,¹⁴⁰ and CEQA requires mitigation, if feasible, of all significant impacts.¹⁴¹ That does not mean agencies must fully resolve environmental problems that their projects only partially cause; an agency may satisfy its CEQA obligations by mitigating its proportional contribution.¹⁴² The agency also may accomplish its share of mitigation in a variety of ways, including participation in regional mitigation programs.¹⁴³ But an agency cannot simply ignore its project’s share of a significant larger impact. If a project’s contribution is incrementally important yet can be avoided or mitigated, the project cannot proceed without such mitigation.

B. Applying CEQA’s Requirements to Climate Change

The CEQA provisions described above constrain state or local public agencies’ contributions to climate change. This section explains how and why.

1. Government Projects and Climate Change Contributions

CEQA’s threshold trigger is a discretionary state or local government action with potential environmental consequences,¹⁴⁴ and much of California’s GHG emissions derive at least partly from discretionary government decisions.

Listing all public agency projects that emit GHGs would require a book, but a partial sampling illustrates the extent to which emissions follow from discretionary

¹³⁹ 14 Cal. Code Regs. §§ 15002(a)(3), (h), 15021.

¹⁴⁰ See 14 Cal. Code Regs. § 15065(a)(3) (stating that “a lead agency shall find that a project may have a significant impact on the environment” if the project “has possible environmental effects that are individually limited but cumulatively considerable.”).

¹⁴¹ Cal. Pub. Res. Code 21081.

¹⁴² 14 Cal. Code Regs. § 15130(a)(3) (“An EIR may determine that a project’s contribution to a significant cumulative impact will be rendered less than cumulatively considerable and thus is not significant. A project’s contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.”); 14 Cal. Code Regs. § 15064(h)(2) (same).

¹⁴³ *Save Our Peninsula Committee*, 87 Cal. App. 4th at 139-40. The *Save Our Peninsula* court also warned, however, that “a commitment to pay fees without any evidence that mitigation will actually occur is inadequate.” *Id.* at 140; *City of Marina*, 39 Cal.4th at 365.

¹⁴⁴ See *Friends of Mammoth v. Bd. of Supervisors*, 8 Cal. 3d 247 (1972)

government action. While vehicular emissions are partly the product of private choices, public agencies plan and build transportation systems, and their decisions strongly influence driving and transit use patterns.¹⁴⁵ Local government is largely responsible for land use planning, which plays a major role in determining automobile dependence.¹⁴⁶ Timber harvests, which release some of the carbon previously stored in forests, are regulated by California's State Board of Forestry.¹⁴⁷ Methane-generating agricultural or industrial facility construction typically is subject to local land use authority. Electric power consumption involves similarly extensive interconnections. State and local agency decisions help control the construction of power plants,¹⁴⁸ and government decisions also affect power demand; every subdivision, industrial project, or water project¹⁴⁹ that public agencies approve necessitates electricity. Public agencies also are major power consumers; the single largest power user in the state is California's State Water Project, which uses an extraordinary amount of energy delivering water to users in southern California.¹⁵⁰

B. GHG-Emitting Projects and Significant Environmental Impacts

Not all discretionary public agency decisions trigger CEQA's requirements; instead, the second major trigger for CEQA's disclosure and mitigation obligations is a

¹⁴⁵ See, e.g., California Department of Transportation, *About Caltrans*, at <http://www.dot.ca.gov/aboutcaltrans.htm> (last checked January 23, 2007) (describing Caltrans' role in building state transportation infrastructure).

¹⁴⁶ Recognizing those interconnections, state and federal air quality planning already is highly intertwined with transportation planning, and just as government decisions help determine how much nitrogen dioxide, carbon monoxide, and particulate matter cars generate, those decisions also play a direct role in creating or controlling carbon emissions. See *EDF, Inc. v. EPA*, 82 F.3d 451, 454-55 (D.C. Cir. 1996) (describing these interrelationships); *1000 Friends of Md. v. Browner*, 265 F.3d 216, 221-22 (4th Cir. 2001) (same); *City of S. Pasadena v. Slater*, 56 F. Supp. 2d 1095, 1101 (C.D. Cal. 1999) (same).

¹⁴⁷ See *Big Creek Lumber Co. v. County of Santa Cruz*, 38 Cal. 4th 1139, 1146-47 (2006). That state regulatory power does not extend, however, to the national forest system's extensive holdings within California.

¹⁴⁸ See, e.g., *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692 (1990) (considering the environmental consequences of constructing a new power plant); California Energy Commission, *Welcome to the California Energy Commission*, at <http://www.energy.ca.gov/commission/index.html> (explaining the CEC's role, which includes "[l]icensing thermal power plants 50 megawatts or larger").

¹⁴⁹ See NATURAL RESOURCES DEFENSE COUNCIL AND PACIFIC INSTITUTE, *ENERGY DOWN THE DRAIN: THE HIDDEN COSTS OF CALIFORNIA'S WATER SUPPLY* 2 (2004) ("According to the Association of California Water Agencies, water agencies account for 7 percent of California's energy consumption and 5 percent of summer peak demand.").

¹⁵⁰ See *ENERGY DOWN THE DRAIN*, *supra* note 149, at 2 ("The California Energy Commission reports that SWP energy use accounts for 2 to 3 percent of all electricity consumed in California.").

potentially significant environmental impact.¹⁵¹ Projects causing GHG emissions create such potential, for the collective result of those contributions is a perfect example of the CEQA maxim “that environmental damage often occurs incrementally from a variety of small sources.”¹⁵² Climate change, in other words, is a perfect example of a cumulatively significant impact.

Every individual GHG-emitting project contributes to climate change. GHGs are generally long-lived and well-mixed, so there is no inconsequential location or time for GHG emissions to occur, and each GHG-emitting project inexorably adds to the worldwide total.¹⁵³ No reasonable doubt exists that rising worldwide totals are already causing, and will continue to cause, severe and sometimes catastrophic consequences.¹⁵⁴ Although those individual contributions might seem small, and articulating a causal chain between individual contributions and particular storms or droughts is impossible, scientists do generally agree that the more GHGs we emit, the more temperatures will rise, with corresponding increases in adverse consequences.¹⁵⁵ While we cannot determine that an individual GHG-emitting project caused an event like Hurricane Katrina or the American Southwest’s recent drought,¹⁵⁶ we know that each GHG-emitting project makes those kinds of events incrementally more likely.

The cumulative consequences of those emissions clearly are significant, for that serious problem is huge in scale. As discussed in Part II, climate change poses an extraordinary environmental threat, with the potential to harm multiple ecosystems, badly damage resource-dependant economies, and diminish the health and safety of millions of people in California and elsewhere.¹⁵⁷ And while California may face particularly acute

¹⁵¹ 14 Cal. Code Regs. § 15130(b)(5). Subsection 15130(e), however, states that for certain types of projects, an EIR need not address impact previously addressed in a prior EIR.

¹⁵² *Communities for a Better Environment v. California Resources Agency*, 103 Cal. App. 4th 98, 114 (2002).

¹⁵³ See *supra* note 41; see also *Massachusetts v. EPA*, 127 S. Ct. 1438, __ (2007) (rejecting EPA’s argument that its contributions to climate change are insufficient to confer standing).

¹⁵⁴ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4; IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 3; Oreskes, *supra* note 25.

¹⁵⁵ See CAL. ENVTL. PROT. AGENCY, *supra* note 3, at 15 (“actions taken to reduce climate change emissions today can reduce the magnitude and rate of climate change this century”).

¹⁵⁶ For this reason, I have heard some CEQA attorneys argue that addressing climate change in EIRs is impossible or pointless. But a cumulative impacts analysis requires a lead agency only to discuss individual emissions and aggregate effects. There is no need to specify how much difference in ultimate effects is attributable specifically to one project.

¹⁵⁷ See *OUR CHANGING CLIMATE*, *supra* note 3; Cal. Health and Safety Code § 38501.

threats, its likely burdens are by no means unique.¹⁵⁸ Both within and outside California's borders, climate change will create highly significant environmental impacts.¹⁵⁹ To put it bluntly, we can therefore be certain that every project that increases GHG emissions makes a serious environmental problem worse.

Those incremental contributions cannot legally be dismissed as *de minimis*, inconsequential, or consistent with plans or policies that will effectively address climate change impacts. California's courts have rejected a *de minimis* exemption to CEQA's cumulative impact requirements, instead cautioning that "the greater the existing environmental problems are, the lower the threshold should be for treating a project's contribution to cumulative impacts as significant."¹⁶⁰ While emissions of conventional air pollutants may be treated as insignificant, even in non-attainment areas, where those emissions comply with applicable plans for attaining regional air quality goals,¹⁶¹ no such plans presently exist for greenhouse gases, and California has established no safe threshold for greenhouse gas emissions. Instead, California's acknowledged need for drastic reductions, and for "[a]ll state agencies [to] consider and implement strategies to reduce their greenhouse gas emissions"¹⁶² vitiates any argument that an incremental increase, unless so small that it is essentially non-existent,¹⁶³ is consistent with state policy or plans. Such increases also create a basic fairness problem; if the overall environmental problem is to be addressed, unmitigated emissions inevitably will force someone else to shoulder that project's "fair share" of responsibility.¹⁶⁴

¹⁵⁸ See IPCC, THE PHYSICAL SCIENCE BASIS, *supra* note 4, at 12-13; IPCC, IMPACTS, ADAPTATION, AND VULNERABILITY, *supra* note 3.

¹⁵⁹ *Id.*

¹⁶⁰ See *Communities for a Better Environment*, 103 Cal. App 4th at 116-21.

¹⁶¹ See 14 Cal. Code Regs. § 15064(h)(3).

¹⁶² Executive Order S-3-05, *supra* note 78; Cal. Health and Safety Code §§ 38592(a)

¹⁶³ *Communities for a Better Environment*, 103 Cal. App 4th at 120 ("the 'one-[additional]-molecule' rule is not the law") (brackets in original; quoting MICHAEL H. REMY ET AL., GUIDE TO THE CALIFORNIA ENVIRONMENTAL QUALITY ACT 476-78 (1998)). Neither *Kings County Farm Bureau* nor *Citizens for a Better Environment* explains how exactly an agency should draw the line between a project contributing one molecule to a larger problem—which contribution presumably would not constitute a significant impact—and a project contributing a cumulatively considerable amount. However, *Communities for a Better Environment*'s rejection of a *de minimis* exception, along with the basic CEQA principle that the act should be interpreted to maximize environmental protection, suggests that the threshold is extremely low, particularly where the emission exacerbates non-compliance with emissions-reduction goals and the ultimate problem is vast.

¹⁶⁴ See 14 Cal. Code Regs. § 15130(a)(3) ("A project's contribution is less than cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.").

The task of addressing climate change impacts also should be quite feasible. Attributing ultimate environmental outcomes solely to a specific project's GHG emissions generally will be impossible, but the basic premise of a cumulative impacts analysis is that collective, not individual, effects matter,¹⁶⁵ and both individual emissions and collective effects are determinable.¹⁶⁶ Ample guidance already exists for projecting an individual project's GHG emissions, and the amount of such guidance is only likely to increase as climate change regulation becomes more prevalent and sophisticated.¹⁶⁷ Likewise, ample documentation of collective effects already exists, and describing those effects by no means requires agencies to project unforeseeable effects or engage in unfounded speculation.¹⁶⁸ Numerous studies, both from California state agencies and from international scientific bodies, describe the anticipated consequences of global GHG

¹⁶⁵ See *Kings County Farm Bureau*, 221 Cal. App. 3d at 722; see also *National Steel Corp. v. Gorsuch*, 700 F.2d 314, 323-24 (6th Cir. 1983) (observing, in a case addressing conventional air pollutants' contributions to non-attainment of air quality standards, that "[t]he fact that there is insufficient technical knowledge to determine the precise degree to which each source contributes to nonattainment does not require that the EPA be prohibited from acting with regard to all sources").

In accordance with those principles, a legally adequate discussion of a project's potential climate change contributions could simply discuss (1) the project's projected GHG emissions; (2) the predicted environmental consequences of those emissions in combination with other similar emission worldwide (a discussion that could be largely adopted from reports issued by the IPCC, the California Climate Change Center, and others); and (3) ways of avoiding or mitigating those project-specific emissions. Describing exactly how much sea level rise or how many storms would be attributable to the specific project would be neither feasible nor useful, and CEQA does not require such discussion.

¹⁶⁶ Many GHG emissions derive directly or indirectly from energy consumption, and lead agencies already are obliged to discuss their projects' energy consumption. See 14 Cal. Code Regs. § 15126.4; CEQA Guidelines App. F, *supra* note 134.

¹⁶⁷ See U.S. Env'tl. Prot. Agency, *State Inventory Guidance*, at http://www.epa.gov/climatechange/emissions/state_guidance.html (describing various resources for estimating GHG emissions) (last checked February 20, 2007); U.S. Env'tl. Prot. Agency, *Personal Emissions Calculator*, at http://www.epa.gov/climatechange/emissions/ind_calculator.html (providing on-line calculator for individual impacts) (last checked February 20, 2007); see also *Planning and Conservation League v. Dept. of Water Resources*, 83 Cal. App. 4th 892, 919 (2000) ("CEQA does compel reasonable forecasting"). Compliance demonstrations for the Clean Air Act are based largely on emissions budgets that state and local agencies develop by predicting the likely emissions from individual projects. See 42 U.S.C. § 7502(c)(4).

This does not mean, of course, that *all* project contributions will readily be calculable; some may involve poorly understood science or complex and uncertain chains of cause and effect. But the fact that some contributions are uncertain does not vitiate the obligation to discuss those contributions that are reasonably foreseeable.

¹⁶⁸ Compare 14 Cal. Code Regs. §§ 15144-45 (stating that agencies need not "foresee[] the unforeseeable or address matters "too speculative for evaluation"). As described detail in the numerous reports cited herein, the connections between GHG emissions and climate change are no longer unforeseeable or speculative.

emissions, and those discussions can easily be quoted or summarized in CEQA-required reports.¹⁶⁹

Though climate change cases are still relatively new to the courts, this type of cumulative environmental problem is not, and CEQA decisions addressing analogous environmental threats support treating GHG emissions as incrementally significant contributions to cumulative impacts. In *Kings County Farm Bureau v. City of Hanford*, a seminal cumulative impacts case, the respondent city had approved a power plant project that would emit ozone precursors.¹⁷⁰ That plant's contributions would have had little effect in isolation, and represented only a small percentage of regional emissions, and the project proponent¹⁷¹ argued that those emissions therefore could not be significant.¹⁷² The court disagreed. Noting that the small contribution would affect an area already beset by excess air pollution, the court required the city to assess whether, given that regional problem, the project's increased emissions would contribute to a significant environmental impact.¹⁷³ "The relevant question to be addressed in the EIR," it held, "is not the relative amount of precursors emitted by the project when compared with preexisting emissions, but whether any additional amount of precursor emissions should be considered significant in light of the serious nature of the ozone problems in this air basin."¹⁷⁴ That reasoning is similarly applicable to climate change. Much as regional air quality problems derive incrementally from many sources, and no one source in isolation would seem important, climate change derives from the individually minor contributions

¹⁶⁹ See, e.g., OUR CHANGING CLIMATE, *supra* note 3; IPCC, THE PHYSICAL SCIENCE BASIS, *supra* note 4.

¹⁷⁰ *Kings County Farm Bureau v. Hanford*, 221 Cal. App. 3d 692, 718-24 (1990).

¹⁷¹ Because CEQA applies to private projects that require discretionary government permits, there often are multiple parties involved in defending the EIR. The lead agency may be the primary defendant, but the private party often leads and funds the defense.

¹⁷² *Id.* at 718 ("The DEIR concludes the project's contributions to ozone levels in the area would be immeasurable and, therefore, insignificant because the plant would emit relatively minor amounts of precursors compared to the total volume of precursors emitted in Kings County."); *id.* at 719 (quoting the EIR: "the EIR has reached the conclusion that incremental effects of the project studied by the EIR are not significant, even though the cumulative ozone impacts of Valley-wide energy development might be considered substantial."). This argument—what one might call the wedding-planner's fallacy ("you're already overspending; what's a little more?")—is incredibly common in environmental disputes, despite its flawed premises.

¹⁷³ *Id.* at 722 ("We find the analysis used in the EIR and urged by GWF avoids analyzing the severity of the problem and allows the approval of projects which, when taken in isolation, appear insignificant, but when viewed together, appear startling.... the standard for a cumulative impacts analysis is defined by the use of the term 'collectively significant'").

¹⁷⁴ *Id.* at 718.

of thousands of projects and actions worldwide, all of which collectively create major consequences.¹⁷⁵

C. GHG Emissions and Avoidance or Mitigation

Because discretionary projects contribute to the GHG emissions that drive climate change, and because those emissions' cumulative environmental impacts are significant, any CEQA study must also discuss ways to avoid or mitigate contributions to those impacts.¹⁷⁶ and unless those measures are infeasible, no CEQA-regulated project may be approved without such avoidance or mitigation measures.¹⁷⁷ As discussed in detail below, such measures generally are available and can be both affordable and capable of generating collateral environmental and economic benefits.

1. Project Alternatives

For many projects, functionally similar alternatives can vastly reduce GHG emissions. Renewable power sources, for example, provide alternatives to constructing fossil fuel power plants. Constructing transit systems often provides a lower-emissions alternative to constructing new roads.¹⁷⁸ Rather than building new water delivery projects, which tend to consume huge amounts of energy, project proponents could implement water use efficiency programs, either within their own supply areas or in areas sharing common water sources.¹⁷⁹ Instead of breaking new ground and building new housing in undeveloped areas, local governments could limit their land use approvals to infill development projects, which tend to require substantially less energy-intensive infrastructure, or could promote higher-density transit-oriented development.¹⁸⁰ Such

¹⁷⁵ Though this issue of individually minor actions collectively creating major consequences is quite common in environmental policy and law, it is by no means unique, or even always a problem. The same phenomenon explains why we go to the polls, and why we protect each individual's right to vote.

¹⁷⁶ Cal. Pub. Res. Code §§ 21002, 21061.

¹⁷⁷ Cal. Pub. Res. Code § 21081.

¹⁷⁸ See, e.g. *Letter from Bill Lockyer, California Attorney General, to Glenn Campbell, Orange County Transportation Authority, Re: Orange County Transportation Authority 2006 Long-Range Transportation Plan Draft Program Environmental Impact Report*, March 30, 2006, at 2-4 (identifying "[i]ncreased public transportation" as one of many measures capable of reducing the GHG emissions from a new regional transportation plan); *REDEFINING PROGRESS*, *supra* note 6, at 80 (summarizing community testimony from low-income Fresno residents, who "spoke extensively on the lack of a reliable and accessible public transportation system in Fresno. Several noted that the development pattern forces people to use their own cars...").

¹⁷⁹ See, e.g., *ENERGY DOWN THE DRAIN*, *supra* note 149, at 34 (describing the costs and benefits of alternative methods of boosting San Diego's water supplies).

¹⁸⁰ Many air pollution control districts already publish guidelines for development patterns that minimize emissions of other pollutants, and the same principles can help minimize GHG emissions. See,

alternatives won't always be feasible—some projects may require a particular location or design—and often environmentally-beneficial alternatives will still create some GHG emissions. Nevertheless, alternatives capable of substantially reducing GHG emissions are fairly often available.

b. On-Site Mitigation

Even if no alternative is capable of avoiding a project's emissions, on-site measures often can substantially mitigate greenhouse gas emissions.¹⁸¹ Developers can use green-building technology and renewable power systems, and build housing with ready transit access and internal or nearby options for grocery shopping and recreation, reducing their projects' energy footprint.¹⁸² A variety of measures, ranging from water recycling to appliance standards to tiered pricing, can reduce energy used to transport, distribute, heat, and dispose water.¹⁸³ Highways, where necessary, can include HOV lanes, and dairy farms and landfills can be constructed with methane-recovery technologies.¹⁸⁴ These examples provide only a partial sampling, and as efforts toward GHG management intensify, an increasing variety of mitigation measures will likely become available.

c. Off-Site Mitigation

Sometimes neither project alternatives nor on-site mitigation measures will be capable of fully avoiding GHG emissions.¹⁸⁵ But even for those projects, off-site

e.g., San Luis Obispo County Air Pollution Control District, *Residential Design Considerations*, available at <http://www.slcleanair.org/business/pdf/residential%20flyer.pdf> (last checked January 23, 2007); SOLANO TRANSPORTATION AUTH. ET AL., *TRANSPORTATION AND LAND USE TOOLKIT* (2003), available at <http://www.ysaqmd.org/planning-info.php>.

¹⁸¹ The distinction between an alternative and a mitigation measure can become quite blurry, and it is difficult to offer a formulation more precise than saying that a mitigation measure involves a small revision to a project while an alternative is a big change.

¹⁸² See San Luis Obispo County Air Pollution Control District, *supra* note 180; SOLANO TRANSPORTATION AUTH. ET AL., *supra* note 180.

¹⁸³ See *ENERGY DOWN THE DRAIN*, *supra* note 149 (describing measures capable of reducing water use, and explaining their benefits).

¹⁸⁴ See United States Environmental Protection Agency, *Methane*, at <http://www.epa.gov/methane/projections.html> (last checked January 23, 2007) ("for many methane sources, opportunities exist to reduce emissions cost-effectively or at low cost by capturing the methane and using it as fuel.... EPA also provides information on cost-effective mitigation options for ruminant livestock emissions.").

¹⁸⁵ Even projects widely viewed as otherwise socially and environmentally desirable—installing infill, low income housing, for example, or operating water-recycling facilities, or developing transit systems—still create GHG emissions, unless those projects are able to purchase their energy from

mitigation should allow projects to achieve GHG neutrality. The primary available method is generally known as emissions trading.¹⁸⁶

The concept behind emissions trading is straightforward. To compensate for increased emissions resulting from a project, the project proponent can reduce its own emissions elsewhere, pay some other entity to commensurately reduce emissions, or undertake or fund actions that will permanently sequester an equivalent amount of carbon.¹⁸⁷ For example, a municipality approving a housing development with some unavoidable emissions might require the project developer to fund a city-wide energy efficiency program creating equivalent emissions reductions. The compensation need not be exactly in kind; for example, the emissions deriving from a new transportation project might be offset by ensuring the conversion of abandoned agricultural land to a permanent forest.¹⁸⁸

In practice, the complexity is greater than in theory, for trading presents potential transparency and verifiability problems.¹⁸⁹ The basic premise of an offset—that it creates a different emissions pattern than otherwise would have existed—can facilitate gaming and false accounting, for calculating what would happen absent the offset can be a speculative counterfactual exercise.¹⁹⁰ “Not-carbon,” as one article recently described it,

sustainable sources. On-site mitigation measures can and should be used to reduce those emissions, but rarely will those measures eliminate emissions entirely.

¹⁸⁶ The term “emissions trading” describes both cap-and-trade systems (in which emissions allowances are traded within a regulated group collectively subject to an emissions cap) and offsets (in which regulated entities pay non-regulated entities to reduce their emissions). Where cap-and-trade systems exist, environmental groups have argued that members of the system should not be allowed to use offsets from groups outside the system, primarily because outside-of-system reductions are far more difficult to track and verify. See TONY DUTZIK AND ROB SARGENT, STOPPING GLOBAL WARMING BEGINS AT HOME: THE CASE AGAINST THE USE OF OFFSETS IN A REGIONAL POWER SECTOR CAP-AND-TRADE PROGRAM 9-11 (2004). But because CEQA will likely apply primarily to emissions not regulated by a cap-and-trade system, this article does endorse the use of offsets, and focuses primarily on offsets as a means of reduction.

¹⁸⁷ See David M. Driesen, *Free Lunch or Cheap Fix? The Emissions Trading Idea and the Climate Change Convention*, 26 B.C. ENVTL. AFF. L. REV. 1, 2-3 (1998) (explaining the basic appeal of emissions trading. Driesen also discusses reasons why trading schemes should be somewhat less enticing than they superficially seem); The Climate Trust, *About Offsets*, at http://www.climatetrust.org/about_offsets.php (last checked January 24, 2007).

¹⁸⁸ See, e.g., The Climate Trust, *Projects*, at http://www.climatetrust.org/offset_projects.php (providing links to project descriptions).

¹⁸⁹ See generally James Salzman and J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607 (2000) (describing some of the pitfalls of environmental trading systems).

¹⁹⁰ See DUTZIK AND SARGENT, *supra* note 186, at 9-11.

is a difficult thing to measure.¹⁹¹ Offset credits may support emissions-reducing measures that would have happened even absent payment, or even that were legally required.¹⁹² Similarly, offset credits may go to projects that don't really create emissions reductions; growing or preserving a forest provides no meaningful sequestration if the forest later is harvested or burned, or if the landowner simply shifts its logging trucks to a forest it otherwise would have left uncut.¹⁹³ Finally, offsetting may create distributional inequities. Mitigating GHG emissions often creates substantial collateral benefits, and utilizing trading can relocate those benefits out of the project areas, which can be problematic if agencies or industries in lower-income areas focus on purchasing offsets while entities in relatively affluent areas prefer to sell.¹⁹⁴ Effective reporting schemes or vigilant regulators could minimize those problems, but if either are absent—and sometimes both will be, for offset markets presently are self-regulated¹⁹⁵—the reality, and thus the legality, of off-site mitigation measures may be highly difficult to discern.¹⁹⁶ Some offset providers are working diligently to correct those problems, but the jury still is out on just how effective offsets will be.

Despite those caveats, well-designed and transparent emissions trades can fulfill CEQA's legal requirements. Though sometimes subject to criticism, using offsets—purchasing conservation easements as partial mitigation for conversion of farmlands or

¹⁹¹ *Trading Thin Air*, THE ECONOMIST, May 31, 2007, available at http://www.economist.com/surveys/displaystory.cfm?story_id=9217960&CFID=9630437&CFTOKEN=30746497.

¹⁹² E.g. Goodell, *supra* note 203 (describing "offset" payments to no-till farmers who had been no-till farming for years before the change occurred).

¹⁹³ See DUTZIK AND SARGENT, *supra* note 190, at 10.

¹⁹⁴ See DUTZIK AND SARGENT, *supra* note 190, at 16-17 (describing collateral benefits of GHG regulation of power plants); see, e.g., Jonathon Remy Nash and Richard L. Revesz, *Markets and Geography, Designing Marketable Permit Schemes to Control Local and Regional Pollutants*, 28 ECOLOGY L.Q. 569, 613-14 (2001) (describing criticisms of the South Coast Air Quality Management District's RECLAIM program). Those concerns should be less salient with GHG regulation than with other pollutants, for most GHGs do not pose health risks other than through their contributions to climate change, which have little to do with their source location.

¹⁹⁵ See, e.g., Goodell, *supra* note 203 (describing reservations about the Chicago Climate Exchange:

Maine Department of Environmental Protection Commissioner David Littell told me that he and other state administrators were 'generally supportive' of CCX's goals but had concerns that the exchange 'was a system set up by private entities, with private transactions, set up to ensure confidentiality.' Why was this a problem? 'It creates an appearance that the emission reductions might not be enforceable and verifiable.

¹⁹⁶ See *City of Marina v. Board of Trustees of California State University*, 39 Cal. 4th 341, 365 (2006).

habitat, for example, or constructing new wetlands to compensate for wetlands destroyed—already is endorsed by regulations¹⁹⁷ and is a commonly used mitigation practice,¹⁹⁸ and agencies often mitigate project impacts by contributing fees to regional mitigation programs.¹⁹⁹ That approach has parallels under other legal regimes; new projects in areas with polluted air quality, for example, often offset emissions by purchasing reduction credits from existing sources.²⁰⁰ Those approaches have legal limitations; a “commitment to pay fees without any evidence that mitigation will actually occur is inadequate” under CEQA, and fictitious or non-verifiable offsets therefore cannot constitute legally sufficient mitigation.²⁰¹ But so long as the reality of reductions or sequestration is verifiable,²⁰² emissions trades should pass legal muster.

Trading also can facilitate mitigation that otherwise would not occur. Sometimes off-site alternatives or on-site measures simply aren’t capable of fully mitigating a project’s emissions, but purchasing offsets generally will be feasible; such offsets already are readily and cheaply available.²⁰³ Under such circumstances, the feasibility of

¹⁹⁷ 14 Cal. Code Regs. § 15370 (allowing agencies to mitigate impacts by “replacing or providing substitute resources or environments”).

¹⁹⁸ See Salzman and Ruhl, *supra* note 189.

¹⁹⁹ See 14 Cal. Code Regs. § 15130(a)(3) (allowing this practice).

²⁰⁰ E.g. *Berkeley Keep Jets over the Bay Com. v. Board of Port Commissioners*, 91 Cal. App. 4th 1344, 1365 (2001) (referring to this technique); *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 713 (1990) (same).

²⁰¹ *City of Marina v. Board of Trustees of California State University*, 39 Cal. 4th 341, 365 (2006).

²⁰² Unlike NEPA, CEQA requires lead agencies to develop and adopt a “reporting or monitoring program” whenever they rely on mitigation measures to avoid a significant adverse environmental impact. See Cal. Pub. Res. Code § 21081.6(a)(1); Karkkainen, *supra* note 106, at 952 (“this modest step represents an important conceptual advance over the federal statute”).

²⁰³ Already several private organizations are offering offsets, the Kyoto Protocol allows emissions trading, and even small amounts of offsets can be purchased quickly, and thus with minimal transaction costs, on-line. See, e.g., www.terrapass.org; The Climate Trust, at <http://www.climatetrust.org/index.php> (last checked January 24, 2007); The Climate Exchange, *The Carbon Counter*, at www.carboncounter.org; *A New Approach to Global Warming*, THE ECONOMIST, Oct. 17, 2002 (describing the Chicago Climate Exchange); Jeff Goodell, *Capital Pollution Solution?*, NEW YORK TIMES, July 30, 2006 (discussing the Chicago Climate Exchange, and also describing the reservations of some of its critics); Driesen, *supra* note 187, at 30-35 (describing the Kyoto Protocol’s mechanisms for emissions trading). Because of transparency issues, some of these offset sources might not qualify as adequate mitigation under CEQA, but some organizations do provide independently-verifiable offset projects. See *infra* note 195 (describing transparency concerns about the Chicago Climate Exchange). As offset markets grow, prices may rise; costs now are low largely because there are many more prospective sellers than buyers. See Jason Margolis, *My Kind of Down: Chicago Climate Exchange Paves the Way for U.S. Emissions Trading*, June 14, 2005, at <http://www.grist.org/news/maindish/2005/06/14/margolis-ccx/> (comparing carbon unit costs in Europe, where caps compel participating in trading schemes, with the substantially lower unit costs in the United States, where participation is purely optional). Nevertheless, because markets should create innovation incentives, the rise in price may not be commensurate with the rise in demand.

offsetting creates a legal obligation to complete mitigation that agencies otherwise could write off as impossible.²⁰⁴ Similarly, while reluctant agencies and project proponents may try to argue that projects' climate change contributions are too small to justify full-scale environmental review or on-site mitigation, and might choose on that basis to ignore CEQA's requirements, trading creates a correspondingly non-intrusive method for mitigating minor emissions. If a project's emissions contributions really are small, so too will be the cost of purchasing offsets, and the agency should readily be able to fully mitigate its impacts, potentially even avoiding the obligation to prepare an EIR.²⁰⁵ Trades thus can facilitate emissions reductions that agencies otherwise might not implement.

VI. EVALUATING THE OBLIGATION: SHOULD CEQA ADDRESS CLIMATE CHANGE?

The basic point of the foregoing discussion is that CEQA requires California's state and local agencies to avoid GHG emissions from projects they implement or approve. But that begs an additional question: *should* CEQA address climate change? Answering that question isn't easy, for laws like CEQA have always provoked controversy. Some detractors argue that they primarily create cost and delay and facilitate obstructionism.²⁰⁶ Others claim that they rely on a naively idealistic assumption that obligatory studies can improve environmental outcomes.²⁰⁷ Even some NEPA and CEQA proponents may view the laws as instruments of project derailment rather than mechanisms for governmental improvement.²⁰⁸ Those critiques for years have provoked political and academic defenses, many centering on the common-sense notion that it is

²⁰⁴ If a project has significant environmental impacts that *can* feasibly be mitigated, the agency cannot proceed with the project without such mitigation in place. If, however, the project has significant adverse environmental impacts that *cannot* feasibly be mitigated, the agency may proceed without mitigation so long as it adopts a "statement of overriding considerations" justifying its decision. See *City of Marina v. Bd. of Trustees of Cal. State Univ.*, 39 Cal. 4th 341, 368 (2006). By expanding the realm of the feasible, offsets therefore can expand mitigation obligations, ensuring that more mitigation actually will occur.

²⁰⁵ See *supra* note 203 (describing offset costs).

²⁰⁶ See Congressional Task Force, *supra* note 15, at 5 ("time and again public sector entities, companies, individuals and organizations have raised issues of cost and process burdens").

²⁰⁷ See, e.g., Joseph L. Sax, *The (Unhappy) Truth About NEPA*, 26 OKLA. L. REV. 239, 239 (1973) ("I think the emphasis on the redemptive quality of procedural reform is about nine parts myth and one part coconut oil."); but see COUNCIL ON ENVTL. QUALITY, *THE NATIONAL ENVIRONMENTAL POLICY ACT: A STUDY OF ITS EFFECTIVENESS AFTER TWENTY-FIVE YEARS* iii (1997) ("Overall, what we found is that NEPA is a success—it has made agencies take a hard look at the potential environmental consequences of their actions, and it has brought the public into the agency decision-making process like no other statute.").

²⁰⁸ See Karkkainen, *supra* note 15, at 339-41 (describing the perspective of a "NEPA monkey wrencher").

seems fairly reasonable to require agencies to disclose environmental consequences before their actions become set in stone,²⁰⁹ and it is perhaps telling that legislative amendments never have significantly weakened CEQA or NEPA, but skepticism about both laws remains common.

That skepticism to some extent overlaps with common distrust of decentralized environmental law enforcement.²¹⁰ Assessment laws like CEQA and NEPA generally do not designate enforcement agencies, and instead are enforced primarily through the discretionary initiatives of professional non-profit groups, ad-hoc citizens' groups, and state or local governments.²¹¹ Such dispersed enforcement, though hailed by some as one of environmental law's most effective innovations,²¹² creates tensions with common preferences for consolidating enforcement authority within the executive branch.²¹³ The geographic scope of climate change is likely to exacerbate those tensions, for animating many objections to environmental litigation has been a belief that grievances affecting broad swaths of society ought not be addressed in the courts.²¹⁴ Because CEQA is a state law, and climate change is partly a national and international problem, its application to climate change also could conflict with trends toward limiting state environmental protection authority.²¹⁵ Drawing upon those strains of skepticism, litigants already have raised many arguments against addressing climate change at any level besides the

²⁰⁹ See, e.g., Adler, *supra* note 15; Bear, *supra* note 15, COUNCIL ON ENVTL. QUALITY; *supra* note 207. In a qualified defense, Professor Karkkainen argues that NEPA is less valuable as an informational device and more valuable as a deterrent against approving projects with potentially significant environmental impacts. See Karkkainen, *supra* note 15.

²¹⁰ See, e.g., Lujan v. Defenders of Wildlife, 504 U.S. 555, 576 (1992) ("Vindicating the public interest... is the function of Congress and the Chief Executive.").

²¹¹ The term "citizen enforcement," though often used to describe this type of dispersed enforcement mechanism, is something of a misnomer, for rarely do individual citizens actually take advantage of citizens suits. Instead, such litigation commonly is instigated by ad-hoc community groups, environmental non-profits, and elected governmental bodies like cities and counties.

²¹² See, e.g., Barton Thompson, *The Continuing Innovation of Citizen Enforcement*, 2000 U. Ill. L. Rev. 185.

²¹³ See Buzbee, *supra* note 17 (describing and critiquing those preferences).

²¹⁴ See, e.g., Mass. v. EPA, 415 F.3d 50, 59-60 (2005), reversed, Massachusetts v. EPA, 127 S. Ct. 1438 (2007) (Sentelle, J. concurring) ("The generalized public good that petitioners seek is the thing of legislatures and presidents, not of courts.").

²¹⁵ See Robert L. Glicksman, *From Cooperative to Inoperative Federalism: the Perverse Mutation of Environmental Law and Policy*, 41 WAKE FOREST L. REV. 719, 786-98 (2006) (describing those trends).

national executive branch, and at any time before the national executive branch is good and ready to act, and CEQA litigation is likely to arouse similar objections.²¹⁶

Critics also are likely to argue that CEQA-based regulation of climate change is unnecessary, for California already has begun developing a new statutory and regulatory framework for addressing climate change—a framework that probably will in some ways become more comprehensive than CEQA.²¹⁷ While CEQA governs only new discretionary decisions by government agencies, the AB 32 program can address purely private actions and emissions that follow solely from past decisions.²¹⁸ The AB 32 program can offer all the potential advantages of centralized regulation, including the economies of workload and communication that generally follow from consolidating implementing responsibility within a single agency. CARB also will have at its disposal a diversity of regulatory instruments. Within the few limits set by the statute and by traditional administrative law constraints, CARB can ban practices or products, order monitoring and reporting, establish markets, and generally select, apply, and enforce whatever regulatory instruments it determines will most efficiently achieve the statutory caps. Under CEQA, by contrast, each agency must perform its own studies, identify its own impacts, generate its own avoidance or mitigation measures, and engage in its own monitoring to ensure those measures' effectiveness, and no centralized authority enforces those obligations. A skeptic might therefore ask what CEQA really can add.

The answer, I explain below, is actually quite a lot. Even statutory schemes that purport to be comprehensive—and AB 32 does not so purport—rarely turn out that way, and environmental assessment laws can help limit or compensate for the “slippage that inevitably occurs.”²¹⁹ They can adapt to new environmental problems, and their

²¹⁶ See, e.g., *Cent. Valley Chrysler-Jeep Inc. v. Witherspoon*, 2005 U.S. Dist. LEXIS 26536, *4 (N.D. Cal. 2005) (describing arguments made in the automakers' challenge to California's regulation of automotive GHG emissions); Thomas W. Merrill, *Global Warming as a Public Nuisance*, 30 COLUM. J. ENVTL. L. 293, 319-328 (2005) (describing, and ultimately rejecting, a foreign policy pre-emption argument; EPA unsuccessfully deployed a similar argument in the *Massachusetts v. EPA* litigation. See 127 S. Ct. 1438, __ (2007)); *Conn. v. Am. Elec. Power Co.*, 406 F. Supp. 2d 265 (S.D.N.Y. 2005) (dismissing a nuisance claim on political question grounds).

²¹⁷ See *supra* Part __.

²¹⁸ See *County of Inyo v. Yorty*, 32 Cal. App. 3d 795, 804-07 (1973) (considering CEQA's applicability to a change to an existing project).

²¹⁹ See Daniel A. Farber, *Taking Slippage Seriously: Noncompliance and Creative Compliance in Environmental Law*, 23 HARV. ENVTL. L. REV. 297 (1999) (describing the ubiquity and implications of “slippage” in environmental law).

amenability to dispersed enforcement allows a breadth of coverage exceeding that achievable under a law implemented solely through the efforts of a single agency. By allowing broad flexibility in selecting mitigation measures and alternatives, environmental assessment laws also can sometimes improve environmental outcomes and spur innovative management at relatively low costs. The disclosure and dialogue they sometimes²²⁰ successfully compel can bolster other regulatory approaches by providing regulatory agencies information and leverage points. Neither CEQA nor any other environmental assessment law is a regulatory panacea; compliance does not come free, and environmental assessment laws have by no means served as perfect antidotes to poor environmental decision-making. Nevertheless, and as explained in more detail below, the potential benefits of applying environmental assessment laws to climate change are great, and at least in this context, many of the standard objections have little force.

A. The Necessity of Complementary Approaches

Individual statutes hardly ever provide comprehensive responses to environmental problems. Sometimes that is by design; legislators may attempt only a preliminary response, leaving comprehensive regulation for a later date.²²¹ Other gaps are inadvertent and unwanted. Understanding the scientific or economic foundations of a problem may prove difficult, for example, and consequent misunderstandings can lead legislators to choose ineffective or insufficiently demanding regulatory instruments.²²² Funding mechanisms may leave implementing agencies short of the resources or leverage

²²⁰ I would not classify myself a full-fledged "NEPA optimist," to use Professor Karkkainen's terms; based on experience as a NEPA and CEQA practitioner, I think it naïve to suppose that environmental impact studies or reports uniformly produce the kind of informed, open, pre-decisional dialogue for which NEPA proponents traditionally hope. But I also find overly cynical and not particularly accurate the suggestion that useful dialogue rarely or never occurs. In my experience, NEPA and CEQA processes often do focus attention on important environmental issues, create a forum for dialogue about the resultant controversies, lead to beneficial changes, some small and some major, in projects, and sometimes stop unwise projects from proceeding. *See also* Adler, *supra* note 15 (describing a moderately successful, and in my view typical, NEPA process).

²²¹ *See, e.g.*, Cal. Health & Safety Code §§ 38550-38551 (requiring cutbacks only to 1990 emissions levels; a long-term solution probably will require significantly greater reductions).

²²² For example, the State Implementation Plan-based regulatory system set up by the Clean Air Act has widely failed to ensure compliance with air quality standards. The system assumes that planning agencies will be able to predict with accuracy what regulatory measures will achieve compliance with air quality standards, but in practice offering such accurate predictions has often proved exceedingly difficult. *See* James D. Fine and Dave Owen, *Technocracy and Democracy: Conflicts Between Models and Participation in Environmental Law and Planning*, 56 HASTINGS L.J. 901 (2005).

necessary to translate statutory aspirations into actual achievement.²²³ New problems may emerge, or old problems may prove more intractable than expected.²²⁴ Executive hostility to legislative mandates may result in those mandates simply being ignored. Those problems seem to be particularly recurrent with first attempts at addressing problems; the Clean Air, Clean Water, and Endangered Species Acts all required several iterations to reach their present form, and each, though in some ways highly successful, has provided only incomplete responses to the problems it was designed to resolve.²²⁵ As we begin drafting statutory remedies for climate change, we may learn from that history, but we probably are also doomed to sometimes repeat it.

Exclusive reliance on one implementing agency or enforcement mechanism exacerbates the potential for gaps. Our environmental laws are filled with statutory provisions whose mandates long went un- or under-enforced, and with regulatory programs that agencies have ignored or found themselves unable to implement.²²⁶ From unmet Clean Air Act deadlines²²⁷ to the troubled history of TMDLs²²⁸ to the rarity of

²²³ See, e.g., *Center for Biological Diversity v. Kempthorne*, 466 F.3d 1098, 1101 (9th Cir. 2006) (considering, and rejecting, the Fish and Wildlife Service's decision to refrain from listing a species because of an alleged funding shortage); Dave Owen, *The Disappointing History of the National Marine Sanctuaries Act*, 11 N.Y.U. ENVTL. L.J. 711 (2003) (contrasting Congressional aspirations for the National Marine Sanctuaries Act with actual achievements, and attributing the discrepancies partly to funding shortages).

²²⁴ Classic examples of this problem include unanticipated but huge increases in vehicle-miles traveled, which delayed Clean Air compliance by offsetting many of the gains from the act's technology standards. See Michael P. Vandenbergh, *From Smokestack to SUV: The Individual as Regulated Entity in the New Era of Environmental Law*, 57 VANDERBILT L. REV. 515, 557-59 (2004).

²²⁵ As discussed in the following notes and cited sources, many Americans live in areas that do not meet federal air quality standards; many American rivers do not comply with water quality standards; and while few species living in the United States have gone extinct since the Endangered Species Act was enacted, few have recovered enough to no longer need the ESA's protections. For discussion of a less well-known first attempt that was never significantly reformed and thus never had anywhere near the effect its original drafters claimed to anticipate, see Owen, *supra* note 223.

²²⁶ See Thompson, *supra* note 212, at 189-90 (describing compliance gaps); Farber, *supra* note 219 (same).

²²⁷ See, e.g., Richard Lazarus, *The Tragedy of Distrust in the Implementation of Federal Environmental Law*, 54 LAW AND CONTEMPORARY PROBS. 311, 324 (1991) (describing failures to achieve goals set by the Clean Air Act); Oliver Houck, *More Unfinished Stories: Lucas, Atlanta Coalition, and Palila/Sweet Home*, 75 U. COLO. L. REV. 331, 386-87 (2004) (same).

²²⁸ *Natural Resources Defense Council v. United States EPA*, 915 F.2d 1314, 1316-17 (9th Cir. 1990) (describing the troubled early history of Congressional attempts to impose water quality standards); Oliver A. Houck, *TMDLs, Are We There Yet?: The Long Road Toward Water Quality-Based Regulation Under the Clean Water Act*, 27 ENVTL. L. REP. 10,391, 10,401 (1997) (describing later failures to implement the Clean Water Act's program for achieving compliance with water quality standards).

recovering endangered species,²²⁹ environmental law provides numerous cautionary examples demonstrating that just because a legislative body promulgates a mandate does not mean the mandate will be fulfilled.²³⁰ Sometimes we fall short because regulated parties use litigation to successfully resist rulemaking or enforcement.²³¹ Politics and budgets create similar limits; even mandates that might superficially seem clear and inarguable, like the Clean Water Act's pollutant discharge prohibitions, have sometimes primarily been enforced by private organizations.²³² Scientific uncertainties can create enforcement problems, as agencies struggle to assign responsibility and overcome burdens of proof. Consequently, when we confront any environmental problem, and particularly one with which we have little prior regulatory experience, it is naïve at best and cynical at worst to suggest that all our eggs can safely go in one enforcement basket.

Similar gaps could easily emerge—and may already be emerging²³³—in the processes of implementing legislative responses to climate change. AB 32, for example, though a landmark law, does not purport to offer a complete response. Full compliance with the statute would reduce emissions only by approximately 25%, but many experts estimate that an 80 to 90% reduction ultimately will be necessary to fully eliminate anthropogenic climate change.²³⁴ Consistent with that limited goal, the statute expressly declines to occupy the regulatory field.²³⁵

²²⁹ Federico Cheever, *The Road to Recovery: A New Way of Thinking About the Endangered Species Act*, 23 *ECOLOGY L.Q.* 1 (1996) (describing the failure of the Endangered Species Act to promote species recovery, despite statutory provisions ostensibly designed to achieve that goal)

²³⁰ See Farber, *supra* note 219, at 299 (describing such regulatory “slippage” as “a feature of environmental law so ubiquitous that we take it for granted”).

²³¹ See, e.g., Thomas O. McGarity, *The Courts and the Ossification of Rulemaking: A Response to Professor Seidenfeld*, 75 *TEX. L. REV.* 525 (1997) (arguing that implementing rules are blocked with excessive frequency).

²³² See Thompson, *supra* note 212, at 199-200 (describing water quality enforcement efforts by the Natural Resources Defense Council and others); Seidenfeld and Nugent, *supra* note 17, at 285.

²³³ See *Arnie's Uphill Climb*, *supra* note 96 (describing California's struggles to implement its climate change legislation).

²³⁴ See *MANAGING GREENHOUSE GAS EMISSIONS*, *supra* note 22, at I-4; Executive Order S-3-05, *supra* note 78; Thomas Wigley, *The Kyoto Protocol: CO₂, CH₄, and Climate Implications*, 25 *GEOPHYSICAL RESEARCH LETTERS* 2285 (1998) (concluding that compliance with the Kyoto Protocol's modest targets would fall well short of removing the human footprint from the global climate). That does not mean these steps are not significant. Even partially reducing a colossal problem can create enormous benefits, especially where the intensity of that problem is a matter of degree. See *supra* notes 22-23 and accompanying text.

²³⁵ Cal. Health and Safety Code §§ 38592(a) (“All state agencies shall consider and implement strategies to reduce their greenhouse gas emissions.”), 38592(b) (“Nothing in this division shall relieve any person, entity, or public agency of compliance with other applicable federal, state, or local laws or

Nor should full compliance, whether with AB 32 or with any other climate change statute, be assumed. CARB, the agency charged with implementing AB 32, has a poor record of attaining compliance with state or federal standards for other air pollutants.²³⁶ CARB's regulatory program may leave GHG sources unaddressed, whether because CARB finds those sources too inconvenient, politically or practically, to regulate, or because it finds sources too far outside its areas of traditional expertise.²³⁷ CARB may underestimate the degree of controls necessary to achieve the statutory goal, or the likelihood of achieving compliance levels sufficient to achieve those goals.²³⁸ Enforcement likewise could prove problematic, particularly if budgetary, legal, or political constraints delay CARB's ability to promulgate a regulatory program.²³⁹ None of these predictions assume any bad faith in CARB's implementation, but the unfortunate reality is that first statutory attempts at addressing widespread problems, though necessary, often fall short of achieving statutory goals, and the need for complementary approaches usually remains.

B. The Functional Advantages of Environmental Assessment Laws

For several reasons, and in several ways, CEQA can provide an important complementary approach, and its breadth of coverage and amenability to flexible compliance can facilitate effectiveness where other regulatory approaches fall short.

1. Breadth of Coverage

Unlike traditional centralized regulatory approaches, which typically focus on a specific set of defined problems—pollution that flows from a point source, for example,

regulations, including state air and water quality requirements, and other requirements for protecting public health or the environment.”), 38598 (“Nothing in this division shall limit the existing authority of a state entity to adopt and implement greenhouse gas emissions reduction measures. [] Nothing in this division shall relieve any state entity of its legal obligations to comply with existing law or regulation.”).

²³⁶ See OUR CHANGING CLIMATE, *supra* note 3, at 5 (describing California's present air quality problems). This isn't entirely CARB's fault. Its challenges derive partly from sources beyond its regulatory control or from trends, like increases in vehicle miles traveled, that derive from land use decisions and other choices over which air quality regulators are not accustomed to exercising authority.

²³⁷ For example, AB 32 implies that the State Board should focus primarily on a subset of sources, see Cal. Health & Safety Code §§ 38530(b)(1), and for reasons of practicality and administrative efficiency the agency is likely to follow that directive. That means, however, that many smaller or more diffuse sources may escape regulation under AB 32, at least immediately and perhaps indefinitely, even though the aggregate effect of those smaller sources could be quite large.

²³⁸ See Farber, *supra* note 219, at 315–16 (noting that standards may be set based on erroneous assumptions of full compliance).

²³⁹ See Thompson, *supra* note 212, at 190–92 (describing the challenges agencies face in monitoring compliance).

or a certain subset of pollutants—CEQA’s scope is broad: it addresses threats to “the environment.”²⁴⁰ That breadth of coverage allows adaptation to unanticipated environmental threats and reduces the risk of interstitial coverage gaps, for CEQA renders unnecessary debates about whether a particular type of environmental threat falls within the statutory scope.²⁴¹ It likewise avoids questions, much like those underlying the recent *Massachusetts v. EPA* litigation, about whether old statutes address new problems;²⁴² if the problem is environmental, CEQA applies. That broad applicability can be invaluable in addressing a problem like climate change, which derives from the contributions of a diverse set of sources, not all of which CARB is likely to find the authority, political capital, or financial resources to regulate. CEQA, in short, can catch emissions that other regulatory programs would likely miss.

CEQA’s traditional amenability to dispersed enforcement also provides a valuable backstop. CARB will likely face the same financial and human resource limitations that have left other regulatory agencies, including EPA, so heavily dependent upon citizen suits.²⁴³ Enforcement personnel will likely be few and may know little about most of the thousands of emissions-causing decisions around the state; budgets will be limited; and CARB may find it has limited political capital to invest in enforcement actions likely to provoke vociferous opposition. CEQA can ease that burden by requiring other agencies to avoid GHG emissions without any initial direction or rulemaking from CARB.²⁴⁴ CARB also can use CEQA to complement its own enforcement efforts. CEQA processes can provide valuable information about emissions-causing decisions, and a CARB or

²⁴⁰ *E.g.* Cal. Pub. Res. Code §§ 21001(g), 21002, 21002.1.

²⁴¹ Such questions are ubiquitous in environmental litigation, and cases often turn not on whether a proposed action poses an environmental threat but rather whether the threat is addressed by the particular statutory provisions at issue. *See, e.g.,* *Sierra Club v. Abston Construction Co.*, 620 F.2d 41 (5th Cir. 1980) (considering whether runoff qualified as a “point source” discharge subject to the Clean Water Act, with no suggestion that the point source determination would reflect the presence or absence of environmental harm). Likewise, some chemicals fall outside existing regulatory regimes not because they aren’t harmful, but because no rule yet addresses the threat they pose. Environmental assessment laws generate their own threshold debates as well, of course; most commonly, the key threshold question is sufficient discretion exists to trigger the laws’ remaining requirements. *E.g.* *DOT v. Pub. Citizen*, 541 U.S. 752, 756 (2004). But those laws at least reach broadly enough to address any form of environmental threat.

²⁴² 127 S. Ct. 1438 (2007). The merits turned on the question, answered in the negative by the D.C. Circuit but in the affirmative by the Supreme Court, whether CO₂ is a “pollutant” subject to the Clean Air Act, not on whether CO₂ emissions are a cause of environmental damage.

²⁴³ *See* Thompson, *supra* note 212, at 190-92 (describing those limitations).

²⁴⁴ *See* Cal. Pub. Res. Code § 21006 (“The Legislature finds and declares that this division is an integral part of any public agency’s decisionmaking process...”).

EPA comment letter identifying deficiencies in an EIR's climate change discussion could quickly spur compliance. The credibility of such agency comment coupled with the threat of private enforcement creates a potent incentive.²⁴⁵ And with or without such agency participation, many projects will proceed under the watchful eye of community groups willing to independently use the CEQA process.

CEQA's age also provides advantages. Until CARB drafts and implements its regulatory program, no one will know how effective it will be, but past experience strongly suggests that significant glitches and gaps will appear, that some key provisions may turn out to be difficult to enforce, and that others may be ignored until CARB establishes a credible enforcement threat.²⁴⁶ CEQA, by contrast, has existed for decades. State and local agencies know its requirements; environmental groups, state and local agencies, and the attorney general's office all have experience enforcing it; and courts are familiar with CEQA litigation and seem to evince a basic understanding of the statute's purposes and goals.²⁴⁷ It is by no means a perfect tool for compelling environmental compliance—between litigation costs and deferential standards of review, the odds generally favor an agency even where arguable non-compliance exists²⁴⁸—but it is at least a familiar one capable of producing immediate results.

²⁴⁵ See Michael C. Blumm and Lawrence R. Brown, *Pluralism and the Environment: The Role of Comment Agencies in NEPA Litigation*, 14 HARV. ENVTL. L. REV. 277 (1990); Adler, *supra* note 15, at 303-05 (describing EPA's participation in a NEPA process).

²⁴⁶ See *supra* notes 221-232 and accompanying text.

²⁴⁷ That understanding is evinced in too many decisions to cite, but one of the more impassioned passages derives from *Citizens for Local Environmental Control v. City of Bakersfield*, 124 Cal. App. 4th 1184, 1220 (2004):

When our morning commutes are marred by the sight of numerous vacant or half-vacant strip malls adorned with graffiti and weeds, when we hesitate to move into an established neighborhood because of the absence of close and convenient shopping and when it hurts to take a deep breath on hot August afternoons because of the poor air quality, the importance of thorough environmental analysis and complete disclosure before new projects are approved is all too evident.

²⁴⁸ While critiques of dispersed enforcement often seem premised upon the notion that plaintiffs need only show up in court to stop a project, as though judges hand out injunctions as readily as dentists provide toothbrushes, plaintiffs actually must take the risk of funding litigation—generally no small task for a non-profit group facing a government agency—and then overcome both procedural objections and deferential review and show that the defendant agency clearly did violate established law. See Buzbee, *supra* note 17, at 203 (“Citizen litigants cannot even begin a case, let alone win it, unless their preferences comport with several layers of political judgments that are part of duly enacted statutory law...”); Cal. Pub. Res. Code § 21168.5 (judicial review “shall extend only to whether there was a prejudicial abuse of discretion”); *Laurel Heights Improvement Ass’n v. Regents of University of California*, 47 Cal. 3d 376, 393 (1987) (describing the deferential standards of review for CEQA cases). To actually obtain injunctive relief, the violation generally also must have been prejudicial.²⁴⁸ Cal. Pub. Res. Code § 21005(b) (directing

None of the foregoing suggests that environmental assessment laws provide catch-all mechanisms for environmental protection. Other regulatory approaches can respond to some threats—particularly those deriving from completed projects—that environmental assessment laws do not redress. There are advantages to utilizing the centralized expertise and regulatory culture of a single implementing agency, rather than depending on the labors of many dispersed decision-makers, some of which have little expertise in or commitment to environmental protection. The downside of dispersed enforcement can be uneven enforcement, with lawsuits reflecting parochial concerns rather than a coherent regulatory agenda. For all of these reasons, laws like CEQA do not obviate the need for laws like AB 32. But imperfection is the hallmark of environmental protection laws, and so long as we cannot create comprehensive statutory responses, reliance on complementary approaches will be indispensable to our efforts to resolve any substantial environmental problem. As role players, if not the stars, in the game of environmental protection, environmental assessment laws like CEQA can add essential complements to a regulatory portfolio.

2. The Feasibility and Flexibility of Compliance

Broad applicability and ready enforcement of a law are of little benefit, of course, if the law is not effective, or if the burdens it imposes dwarf the benefits it produces. Some commentators have leveled just such a critique at environmental disclosure laws like CEQA, claiming that the information they produce is largely irrelevant to actual decisions, and that the costs of preparing environmental studies do not justify the meager benefits produced.²⁴⁹ Neither critique applies particularly well to CEQA-based regulation of climate change contributions, however, for the benefits are important, and the burdens, though real, can be surprisingly small.²⁵⁰

courts to “continue to follow the established principle that there is no presumption that error is prejudicial”). Projects generally are enjoined, in other words, only when the approval process was fairly obviously illegal and a plaintiff had the money, determination, and persistence to do something about it, not just because a plaintiff woke up feeling litigious.

²⁴⁹ *E.g.* Sax, *supra* note 207, at 239 (offering the irrelevance critique, which Professor Sax later to some extent reassessed); CONGRESSIONAL TASK FORCE, *supra* note 15, at 5 (summarizing the cost critique). As discussed above (*see supra* note 220), I generally disagree with those critiques.

²⁵⁰ What follows is not a quantitative cost-benefit analysis, which would be exceedingly difficult for even a brilliant economist (which I am not) to produce. It instead is a qualitative discussion of the likely benefits and burdens. But even that qualitative discussion should be sufficient to allow useful comparisons.

a. Benefits

The most important benefit of applying CEQA to climate change is likely to be a reduction in GHG emissions. CEQA's substantive mandate and procedural incentives both should induce agencies to avoid projects with large emissions and to reformulate lower-emissions projects in ways that reduce or eliminate their emissions contributions. While those reductions will not eliminate California's contributions to climate change, and will not address emissions from other states or countries, even an incremental improvement in a problem of such massive scale can create a significant aggregate benefit. A miniscule-percentage reduction in the risk of extreme weather events, for example, can represent a significant number of lives saved when one considers that the risk of such events is borne by billions of people throughout the world.²⁵¹ Moreover, while we cannot simply presume that incremental actions in places like California will be sufficient to achieve a complete resolution of climate change problems—California's actions create few constraints elsewhere²⁵²—those local efforts can test policy strategies for use elsewhere, spur the development of mitigation technologies, and defuse the common moral argument that until the U.S. reduces its emissions, developing nations have no obligation to reduce theirs.

CEQA also can improve the equity of other regulatory approaches. Environmental regulation often creates thorny fairness questions, particularly where a small subset of the contributors to a problem is asked to bear the lion's share of regulatory burdens.²⁵³ Those fairness concerns could be acute if regulation is left solely to CARB, which may have the political will or institutional capacity to address only a

²⁵¹ This ultimately is a matter of mathematics, for the level of impact is generally a product of the change in risk and the extent of exposure. Suppose a hypothetical project creates a risk increase from 0.01 extreme-weather deaths per million people per year to 0.02 deaths per million people per year, but the increased risk is felt among six billion people worldwide. While we might consider that change negligible if it impacted only one hundred people, worldwide it would likely cause an additional sixty deaths per year, an adverse outcome that might vastly outweigh any benefits the project might produce.

²⁵² To posit a possible causal relationship is not implausible, however. California's actions and innovations could play an important role in spurring federal responses, and many commentators believe no broadly-inclusive response will occur so long as American inertia provides a rhetorical justification for inaction in other nations. See *Everybody's Green Now*, THE ECONOMIST, June 2nd-8th 2007, special report at 6 ("If America continues to refuse to control its carbon dioxide emissions at the federal level, there is no chance that countries such as China and India, whose emissions will soon overtake America's, will control theirs.").

²⁵³ See Carol M. Rose, *The Story of Lucas: Environmental Land Use Regulation Between Developers and the Deep Blue Sea*, in ENVIRONMENTAL LAW STORIES, *supra* note 17, at 239.

familiar subset of sources while giving others a free ride. Emissions-reduction mandates create a zero-sum game; and every free ride enjoyed by a non-regulated project will either push California further from achieving its reduction targets or require greater sacrifices by those who fall under the regulatory program, and regulated groups that might chafe at such differential treatment should appreciate the more inclusive approach allowed by CEQA. Some unevenness in the distribution of regulatory burdens is of course inherent in almost any governmental action, and achieving perfect fairness in climate change regulation will be impossible. But by broadening the scope of responsibility, CEQA can at least reduce the consequent “why-me?” moments,²⁵⁴ when regulated parties ask why they bear a seemingly disproportionate share of regulatory burdens.

Compliance with CEQA’s mandates also can generate other significant collateral benefits. Limiting GHG emissions can spur development of mitigation technologies, and those incentives in turn may boost California’s economy by turning the state into an incubator for green research and development.²⁵⁵ Should California then export those technologies, the state may doubly benefit, first from the economic benefits of its exports and again from consequent reductions in GHG emissions elsewhere. Secondary economic and environmental benefits also may follow from measures to reduce GHG emissions, for reduction measures often promote efficiency and incidentally mitigate other potential environmental harms. Reduced energy consumption, for example, saves money. Minimizing automobile use can lower traffic, noise, and other pollutant emissions; and reducing water consumption can leave more water in rivers, streams, and aquifers.²⁵⁶ Though the primary benefit of emissions reductions almost always will be the consequent reduction in climate change, the collateral bonuses can also be significant.

2. Burdens

Though few people dispute the value of some environmental protection, the most common critique of environmental assessment laws alleges that the time and effort

²⁵⁴ See *id.* at 260-61. I don’t suggest that focused GHG emissions regulation would be likely to effect a taking, but instead that it might offend the fairness instincts that also motivate many takings claims.

²⁵⁵ See Cal. Env’tl. Prot. Agency, *supra* note 3, at ____.

²⁵⁶ In fact, the potential collateral benefits are sufficiently great that environmental justice advocates have warned of the potential unfairness if emissions trading regimes concentrate GHG-reduction efforts disproportionately in wealthy areas, while leaving low-income communities unable to reap the beneficial consequences of localized GHG reduction.

required for compliance produces costs disproportionate to any benefits received. Such critiques are likely to be particularly prevalent where such laws apply to climate change; why, critics will ask, should we go through all the procedural hassle of EIR preparation, let alone the financial cost of installing mitigation systems, to address GHG sources that contribute only fractions of a percentage of the worldwide output? In practice, however, those compliance burdens need not be nearly so high as some critiques of environmental disclosure laws might suggest.

In most circumstances, proactive mitigation can minimize procedural compliance costs. An agency must prepare a full EIR only if its project may have significant adverse environmental impacts, and by committing at the outset to full mitigation of any potentially significant impact, the lead agency can instead proceed on the basis of a “mitigated negative declaration,” thus avoiding the expense and delay of EIR preparation.²⁵⁷ Many CEQA lead agencies, and an overwhelming majority of NEPA lead agencies, take exactly that course in addressing other environmental impacts, and that option should remain readily available for mitigating climate change contributions.²⁵⁸ By adopting all feasible on-site mitigation techniques and offsetting any potential impacts that remain—something agencies will be obligated to do anyway at the end of the CEQA compliance process—agencies can ensure that potential climate change contributions never serve as the source of an obligation to prepare an EIR.

Even where agencies do prepare EIRs, a discussion of climate change contributions need not add significantly to the resulting expense. Tools already are available online for calculating carbon footprints,²⁵⁹ and lead agencies also can piggyback their GHG emissions calculations on work they already must do to calculate energy consumption,²⁶⁰ traffic generation, and emissions of other air pollutants.²⁶¹ Some

²⁵⁷ See 14 Cal. Code Regs. § 15369.5.

²⁵⁸ See Karkkainen, *supra* note 106, at 932-37.

²⁵⁹ See, e.g., California Climate Action Registry, Protocols, at <http://www.climateregistry.org/PROTOCOLS/> (last checked June 12, 2007) (providing links to protocols for assessing emissions);

²⁶⁰ See CEQA Guidelines App. F, available at http://www.ceres.ca.gov/topic/env_law/ceqa/guidelines/Appendix_F.html (last checked June 11, 2007).

²⁶¹ The same fossil fuel combustion activities responsible for most of California’s GHG emissions also emit conventional pollutants like nitrogen dioxide, particulate matter, and volatile organic compounds, and projects in non-attainment areas—which include most of California—generally must address those

projects will require more than a ready-for-download analytical method, and some emissions contributions may remain difficult to calculate precisely,²⁶² but as climate change regulation becomes more widespread, and as carbon markets develop, the availability and sophistication of emissions-assessment tools should only increase.²⁶³ Likewise, discussions of the aggregate effects of GHG emissions could be essentially boilerplate; every GHG-emitting project ultimately contributes to the same set of cumulative impacts, and those impacts are amply described in a large and growing set of reports readily available on the internet.²⁶⁴

Actual physical avoidance of GHG emissions isn't cost-free, but CEQA's substantive mandate comports with what many environmental law scholars have described as a model method for achieving environmental protection. Since the 1970s, many legal and economic scholars have blasted technology-based, "command-and-control" environmental laws as inefficient and undemocratic, arguing that environmental laws instead should define performance standards and allow regulated parties flexibility, including access to emissions-trading systems, in achieving those standards.²⁶⁵ Environmental markets, they argued, and a willingness to allow diverse compliance mechanisms would create innovation incentives, allow lower-cost allocations of regulatory burdens, and focus government attention on more fundamental questions about goals and allowable pollutant levels rather than individual process technologies.²⁶⁶ Those

emissions as part of EIR preparation. See, e.g., *Kings County Farm Bureau v. City of Hanford*, 221 Cal. App. 3d 692, 718-24 (1990) (addressing an EIR's discussion of pollutant emissions).

²⁶² For example, calculating how land use changes will affect emissions may will almost invariably create some tricky causality questions, and views may differ on the extent to which emissions can be attributed to specific projects rather than background trends.

Nothing in CEQA exempts a lead agency from mitigating its contribution to a significant adverse impact simply because that impact cannot be delineated precisely, and the difficulties associated with some emissions projections do not remove the obligation to attempt, to the best of the lead agency's ability, to remedy emissions that reasonably can be expected to occur. The imprecision of calculations instead is likely only to necessitate some leeway in judicial review of the agency's calculations of potential contributions.

²⁶³ See Cal. Health & Safety Code § 38530 (providing for emissions inventorying and monitoring).

²⁶⁴ See, e.g., IPCC, *IMPACTS, ADAPTATION, AND VULNERABILITY*, *supra* note 3; OUR CHANGING CLIMATE, *supra* note 3; CAL. ENVTL. PROT. AGENCY, *supra* note 3.

²⁶⁵ See, e.g., Bruce A. Ackerman and Richard B. Stewart, *Reforming Environmental Law*, 37 STANFORD L. REV. 1333 (1985); Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law: The Democratic Case for Market Incentives*, 13 COLUMBIA J. ENVTL. L. 171 (1988). The Ackerman and Stewart articles are part of a huge body of similar scholarship, and a comprehensive footnote could double the length of this article.

²⁶⁶ See *id.*

critiques have been controversial, with others arguing that a traditional approach was reasonably functional, or that actual practice bore little correspondence to the reformers' critique,²⁶⁷ and that the promise of markets is often exaggerated.²⁶⁸ Nevertheless, the reformers' core argument—that a legal regime establishing mandatory goals but allowing flexible compliance mechanisms can sometimes improve efficiency and promote innovation—seems intuitive, has some empirical support,²⁶⁹ and has been highly influential in the development of climate change regulatory methodologies.²⁷⁰

Though its enactment preceded much of the post-command-and-control scholarship, CEQA's substantive mandate establishes a regulatory methodology in some ways quite similar to what those reformers advocated. It defines a functional standard for substantive outcomes: projects shall not cause significant environmental impacts if those impacts are feasibly avoidable.²⁷¹ Other than mandating that mitigation commitments be verifiable and enforceable,²⁷² however, it establishes few constraints on the methods agencies use to achieve those goals. Re-designing projects, using any kind of on-site mitigation, or using any kind of off-site mitigation all are fine, and technology controls, market mechanisms, or other economic incentives all are acceptable; the agency just has to show that its chosen mechanism will work. Many would argue that CEQA allows too much flexibility; rarely is it easy to monitor whether mitigation actually is working,²⁷³ and projects therefore may slide through the CEQA process based on credible but

²⁶⁷ See Farber, *supra* note 219, at 316.

²⁶⁸ See, e.g., Howard Latin, *Ideal versus Real Regulatory Efficiency: Implementation of Uniform Standards and 'Fine-tuning' Regulatory Reforms*, 37 STAN. L. REV. 1267 (1985); see also Salzman and Ruhl, *supra* note 189 (analyzing factors that can affect the effectiveness of environmental trading systems).

²⁶⁹ The most often-cited example of a successful market-based approach to environmental regulation is the acid rain program enacted as part of the 1990 Clean Air Act amendments. See, e.g., Salzman and Ruhl, *supra* note 189, at 621.

²⁷⁰ E.g. Salzman and Ruhl, *supra* note 189 (describing increasing utilization of trading regimes); MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, at ES-5 ("Emission offsets provide an opportunity for cost-savings and economic development, and thus should be included under conditions that reduce the prospects for fictional emissions reductions and inefficient revenue transfers.").

²⁷¹ See Cal. Pub. Res. Code § 21081.

²⁷² See *City of Marina v. Board of Trustees of California State University*, 39 Cal. 4th 341, 365 (2006).

²⁷³ CEQA requires agencies to develop programs to monitor the effectiveness of any mitigation measures used to support a mitigated negative declaration, and requires that those measures be "fully enforceable." See Cal. Pub. Res. Code § 21081.6. Nevertheless, attention to compliance with mitigation measures may be significantly less than attention to initial decisions, and mitigation conditions also may be modified or deleted if an agency finds them "to be impracticable or unworkable." *Lincoln Place Tenants Assn. v. City of Los Angeles*, 130 Cal. App. 4th 1491, 1508 (2005).

ultimately inaccurate assurances that mitigation programs will succeed.²⁷⁴ But if stakeholders and courts remain alert to the reality that real mitigation requires effective monitoring and enforcement structures,²⁷⁵ CEQA allows creativity in selecting or developing cost-effective mitigation techniques. Such flexibility cannot eliminate costs, of course, but it can reduce them, while also promoting innovations that could prove useful and marketable even beyond California's borders.

C. The Logic of Non-Exclusive Local Control

The other likely set of objections to CEQA-based climate change regulation concerns not the burdens or benefits of environmental assessment laws, but rather the efficacy or even constitutionality of addressing a global problem partly through localized legal regimes. Local agencies, skeptics may suggest, have neither the authority nor the competence to address a problem with so many international dimensions, and response efforts ought to come from the federal or even international level. In its most extreme version, the argument suggests that local regulation will make climate change worse: by regulating internally, California might reduce the federal government's bargaining chips in international negotiations.²⁷⁶ In various forms, such theories already have frequently been tested in climate change litigation, and those tests are likely to continue.²⁷⁷ Nevertheless, those critiques also wither under close examination, for CEQA asks local agencies only to analyze and address the consequences of their own actions, a task that exceeds neither local authority nor local competence.

While climate change is global, and climate change regulation does have international dimensions, CEQA's provisions fall well within the state's traditional

²⁷⁴ See Karkkainen, *supra* note ___, at 908 (identifying this threat with mitigated FONSIs, which are the NEPA equivalent of mitigated negative declarations).

²⁷⁵ See Cal. Pub. Res. Code § 21081.6; e.g. Lincoln Place Tenants Assn., 130 Cal. App. 4th at 1507-10 (finding illegal a city's failure to comply with earlier mitigation measures).

²⁷⁶ See, e.g., Massachusetts v. EPA, Oral Argument Transcript, Nov. 26, 2006, at p. 50 lines 4-7 (question from Justice Scalia) ("If we have done everything we can to reduce CO2, you know, what deal do we make with foreign nations? What incentive do they have to go along with us?").

²⁷⁷ See, e.g., Cent. Valley Chrysler-Jeep Inc. v. Witherspoon, 2005 U.S. Dist. LEXIS 26536, *4 (N.D. Cal. 2005) (describing arguments made in the automakers' challenge to California's regulation of automotive GHG emissions); Conn. v. Am. Elec. Power Co., 406 F. Supp. 2d 265 (S.D.N.Y. 2005) (dismissing a nuisance claim on political question grounds); Mass. v. Env'tl. Prot. Agency, 127 S.Ct. 1438 (2007) (rejecting standing arguments and arguments that presidential foreign policy powers allowed EPA to avoid regulating GHG emissions); Friends of the Earth v. Watson, 2005 U.S. Dist. Lexis 42355 (N.D. Cal. 2005) (rejecting a motion for summary judgment alleging that plaintiffs lacked standing to challenge the defendants' failure to address climate change in EISs).

regulatory power. CEQA governs only actions taken within California. Neither the statutory text nor any reported judicial decision even purports to apply CEQA to decisions made or actions taken beyond the state's borders. Moreover, the triggers for CEQA's applicability—discretionary decisions by state and local government agencies—further preclude charges of usurpation of other authority.²⁷⁸ Absent directly contrary federal authority, states clearly can control the actions of their own political subdivisions, and federal jurisprudence has generally protected that prerogative.²⁷⁹

The fact that within-state CEQA enforcement will limit cross-border benefits provides no reason for limiting that authority. Local actions clearly do have consequences outside California, and those consequences in part explain the significance of GHG emissions and the importance of addressing them.²⁸⁰ Nevertheless, a state law with cross-border impacts is not at all unprecedented; many air or water pollution control rules benefit downwind or downstream jurisdictions. Nor are such rules unfair or politically suspect; while legal doctrines like the dormant commerce clause protect against state actions that unfairly protect in-state interests at others' expense, there is little reason to fear state laws that impose in-state expenses to create benefits extending beyond state lines.²⁸¹ Such laws simply require acting as a good neighbor.

Nor does CEQA's applicability to climate change threaten to improperly interject state or local agencies into international affairs. State-based climate change regulation obviously does have some international effects—that is partly the point—but the mere existence of such effects does not imply any improper intrusion into foreign policy. Almost any state law could conceivably have some international effect, and few would suggest that states should forfeit their police powers any time exercising those powers might have a negative effect on trade, immigration, or some other subject of international discussion.²⁸² The effects of such efforts also are unlikely to be negative. California's

²⁷⁸ See Cal. Pub. Res. Code § 21000(g), 21002, 21002.1 (directing CEQA's mandates at the conduct of state and local agencies).

²⁷⁹ See, e.g., *New York v. United States*, 505 U.S. 144 (1992).

²⁸⁰ See IPCC, *THE PHYSICAL SCIENCE BASIS*, *supra* note 4 (explaining those effects, and how they come about).

²⁸¹ See, e.g., *Philadelphia v. New Jersey*, 437 U.S. 617 (1978).

²⁸² See generally Merrill, *supra* note __, at 328 (discussing federal nuisance claims: "A suit brought by legal officers of American States against American defendants under a cause of action based on American common law is not pre-empted just because a favorable outcome in the action might have reverberations or ramifications for the conduct of American foreign policy.").

efforts may help persuade China or India to respond, for technological innovations may help lower costs elsewhere, or may blunt arguments that America is in no moral position to ask other countries to act.²⁸³ Traditional local regulation of local decisions also does not constrain the ability of the federal government or of other nations to act on a broader scale.

Though the ultimate problem is in some ways global, the analyses required by CEQA also fall within the competence of local agencies. Those agencies are perfectly capable—perhaps more capable than any other level of government—of predicting the quantity of GHGs their own projects could emit, and of devising feasible methods for avoiding such emissions.²⁸⁴ Discerning that those local contributions will exacerbate the larger problem, and discussing the scope of that larger problem, is similarly straightforward, and requires only downloading and reading any one of an increasing number of reports prepared for policy-making audiences.²⁸⁵ The expression “think globally, act locally” may be one of environmentalism’s biggest clichés, but with climate change regulation, it is a reasonable and feasible approach.

CONCLUSION

In coming years, local, state, and national governments will likely take many steps to regulate GHG emissions and reduce climate change. Those actions are indispensable; to address this challenge, we must develop new legal regimes and regulatory approaches. But existing law also can help. The core principles of CEQA already require California’s public agencies to evaluate and take steps toward addressing climate change. Compliance with those mandates can help move the state—and, through imitation, the nation and the world—toward resolving one of the most pressing environmental problems of our era.

²⁸³ See THE ECONOMIST, *supra* note ___, at 6 (asserting that China will do nothing significant if the U.S. does not act first).

²⁸⁴ See *supra* note 167 (discussing available tools for calculating GHG emissions).

²⁸⁵ E.g. IPCC, THE PHYSICAL SCIENCE BASIS, *supra* note 4; OUR CHANGING CLIMATE, *supra* note 3; MANAGING GREENHOUSE GAS EMISSIONS, *supra* note 22, PEW CENTER FOR GLOBAL CLIMATE CHANGE, *supra* note 21.

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8
9
10 IN THE UNITED STATES DISTRICT COURT
11 FOR THE EASTERN DISTRICT OF CALIFORNIA

12 **NATURAL RESOURCES DEFENSE**
13 **COUNCIL, et al.,**

14 Plaintiffs,

15 v.

16 **DIRK KEMPTHORNE, in his official capacity**
as Secretary of the Interior, et al.,

17 Defendants,

18 **SAN LUIS & DELTA-MENDOTA WATER**
19 **AUTHORITY and WESTLANDS WATER**
20 **DISTRICT; CALIFORNIA FARM BUREAU**
21 **FEDERATION; GLENN-COLUSA**
22 **IRRIGATION DISTRICT, et al.;**
CALIFORNIA DEPARTMENT OF WATER
RESOURCES, and STATE WATER
CONTRACTORS,

23 Defendant-Intervenors.

05 CV 01207 OWW (LJO)

DECLARATION OF JOHN
LEAHIGH IN SUPPORT OF THE
CALIFORNIA DEPARTMENT OF
WATER RESOURCES'
PROPOSED INTERIM REMEDY

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: Hon. Oliver W. Wanger

24
25 I, John Leahigh, declare as follows:

26 1. I am employed by the Department of Water Resources (DWR) as Chief of the Project
27 Operations Planning Branch (POPB) within the Division of Operations and Maintenance. I have
28 been in my current position since March 2005.

1 2. I am responsible for short-term planning of water operations for the State Water Project
2 (SWP). These planning responsibilities include the estimation of delivery capabilities of the SWP
3 and forecasted water export operations from the Sacramento/San Joaquin Delta (Delta) through the
4 Harvey O. Banks Delta Pumping Plant (Banks), Skinner Fish Protection Facility (Skinner), and
5 Clifton Court Forebay (CCF).

6 3. Prior to taking the position of Chief of the POPB, I worked within the branch in various
7 engineering classifications from November 1996 through February 2005. I have worked for DWR
8 since May 1992. I received a Bachelor's degree in Civil Engineering from the University of New
9 Mexico in 1989 and a Master's degree in Civil Engineering with emphasis on Water Resources
10 Engineering from California State University at Sacramento in 1999. I am a registered Civil
11 Engineer in the State of California.

12 4. One of my responsibilities as Chief of the POPB is to supervise the work of engineering
13 staff that develop and monitor studies, projections and delivery capabilities of the SWP. I coordinate
14 with a team of engineers to plan and schedule water export operations based on water availability,
15 water permit/quality restrictions, environmental needs, and projected hydrology.

16 5. I have personal knowledge of the facts stated herein, and, if called to do so, could and
17 would testify competently thereto.

18 6. I am familiar with and contributed to the development of the proposed remedy actions, set
19 forth in the Delta Smelt Action Matrix for Water Year 2008 (Action Matrix)^{1/}, proposed by the
20 United States Fish and Wildlife Service (USFWS), as supported by DWR. The Action Matrix has
21 been developed to minimize and prevent adverse impacts to delta smelt and its habitat from SWP
22 and CVP operations during the interim period pending completion of the consultation on the delta
23 smelt with USFWS. I am informed and believe that the USFWS will complete the consultation and
24 issue its biological opinion before August 2008.

25 ///

26

27

28 1. A copy of the Action Matrix is attached as Exhibit A to the Declaration of Jerry Johns in
Support of the California Department of Water Resources' Proposed Interim Remedy, filed
concurrently herewith.

1 7. I have worked with POPB staff to develop an estimate of the water costs associated with
2 implementation of the Action Matrix through July 2008.

3 8. For the purposes of the following analysis, "water costs" are defined as the estimated
4 export reductions and the estimated reductions in deliveries of water to CVP/SWP contractors
5 for 2008 as a result of implementing the actions described in the Action Matrix.

6 9. The term "baseline" is defined as the expected delivery of water without implementing the
7 Actions proposed in the USFWS remedy matrix. Baseline water deliveries often vary depending
8 on hydrology and the costs estimates are based on two different hydrology assumptions, as
9 described in detail below.

10 10. Water supply forecasting requires a projection of initial reservoir storages and forecasted
11 runoff as a foundation to delivery estimates. Reliable projections are available for the initial
12 reservoir storages going into 2008, but the forecasted runoff is largely dependent on the amount
13 of precipitation that will be experienced next year, which is unknown and could vary greatly.
14 Water supply costs were analyzed for 2008 with two different assumptions on the amount of
15 precipitation that may be experienced in 2008: dry and average.

16 11. A year with low precipitation or a "dry year" for the purposes of my analysis assumes the
17 amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded
18 90% of the time over the past 85 years.

19 12. A year with average precipitation or an "average year" for the purposes of my analysis
20 assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was
21 exceeded 50% of the time over the past 85 years.

22 13. Although many different assumptions could be made for the amount of precipitation that
23 could occur in any year, assumptions of precipitation at a 90% and 50% chance of exceedence
24 are the most widely used water supply forecasting assumptions. These two hydrologic
25 assumptions generally give a good analytical range for project operations.

26 **EXISTING RESTRICTIONS ON WATER DELIVERIES**

27 14. DWR provides water to twenty-nine (29) contractors throughout California under water
28 right permits issued by the State Water Resources Control Board (SWRCB). These permits

1 include restrictions on water exports. The DWR permit most recently issued by the SWRCB
2 resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the
3 decision can be found at 14. DWR provides water to twenty-nine (29) contractors throughout
4 California under water right permits issued by the State Water Resources Control Board
5 (SWRCB). These permits include restrictions on water exports. The DWR permit most recently
6 issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641
7 (D-1641). Details of the decision can be found at
8 <http://www.waterrights.ca.gov/baydelta/d1641.htm>.

9 15. The water costs associated with the Action Matrix are measured against allowable
10 deliveries under baseline operations, considering all flow and water quality objectives required
11 by D-1641. Through D-1641, the SWRCB assigns responsibility for meeting water quality
12 objectives adopted in the Water Quality Control Plan ("WQCP") for the San Francisco
13 Bay/Sacramento-San Joaquin Delta Estuary. These WQCP objectives protect fish and wildlife,
14 and the agricultural, municipal and industrial uses of water.

15 16. The WQCP was updated in 2006. The new plan did not result in any changes in the
16 requirements of D-1641. The new WQCP can be found at
17 <http://www.waterrights.ca.gov/baydelta/docs/rev2006wqcp.pdf>.

18 17. A team of engineers and I took into account the restrictions imposed by meeting the
19 objectives of the WQCP when developing the estimates for water costs associated with the
20 implementation of the Action Matrix.

21 ASSUMPTIONS FOR THE IMPLEMENTATION OF ACTIONS

22 18. I assumed in the analysis that Action 1 would be triggered and implemented as of
23 December 25, 2007 and continue through January 3, 2008. December 25 is described as the first
24 possible day to trigger this 10-day Action in the Action Matrix.

25 19. I assumed in the analysis that delta smelt spawning will occur on February 20, 2008.
26 February 20 is the date on which DWR biologists have estimated that spawning has begun
27 historically. This assumption establishes the durations of Actions 2 and 3, which could vary
28 significantly. The end of Action 2 and the trigger for the start of Action 3 is the onset spawning

1 as described in the Action Matrix.

2 20. In the Action Matrix, Actions 3 and 4 assume a range of flow objectives. A range of Old
3 and Middle River upstream flows between 0 and 4000 cubic feet per second (cfs) is explicitly
4 described and assumed for analyzing Action 3.

5 21. Action 4 does not have targeted flow but allows a range similar to Action 3 (from zero to
6 approximately 4000 cfs).

7 22. Because the Action Matrix describes Actions 3 and 4 flow objectives as a range I
8 assumed a range for water costs as well. The high end of this range assumes that the Old and
9 Middle River objective is 0 cfs for both Actions 3 and 4. For determining the lower costs in the
10 range I assumed that Action 3 is implemented at the 4000 cfs flow objective and Action 4 is not
11 triggered, resulting in no water costs.

12 23. This range of cost was necessary as part of the analysis because of the uncertainty
13 related to the real-time distribution of delta smelt and the susceptibility of this distribution to the
14 exports as noted in footnotes of the Action Matrix.

15 **ESTIMATED EXPORT REDUCTIONS**
16 **ASSOCIATED WITH THE USFWS'S REMEDY PROPOSAL**

17 24. Implementation of flow objectives in the Action Matrix will require reductions in export
18 operations by the SWP and CVP. My team of engineers and I estimated ranges of export
19 reductions associated with each Action in the Action Matrix. The ranges are based on 2008
20 being dry or having average precipitation as defined earlier. In addition, Actions 3 and 4 have
21 sub-ranges due to their adaptive nature.

22 25. Action 1 - Winter Pulse Flow to Benefit Adult Spawning: CVP and SWP target upstream
23 Old and Middle River flow not to exceed 2,000 cfs for a 10-day period during late December or
24 early January. This action is estimated to reduce combined project exports by 100 thousand
25 acre-feet (taf) in a dry year and 160 taf in an average year.

26 26. Action 2 - Adult Salvage Minimized: CVP and SWP target upstream Old and Middle
27 River flow not to exceed 4,500 cfs from early January to late February. This action is estimated
28 to reduce combined project exports by 150 taf in a dry year and 500 taf in an average year.

1 27. Action 3 – Larval and Juvenile Protection: CVP and SWP target upstream Old and
2 Middle River flow between 4,000 cfs to 0 cfs from late February through the end of May. This
3 action is estimated to reduce combined project exports by 60 taf to 500 taf in a dry year and 640
4 taf to 1.3 million-acre feet (maf) in an average year.

5 28. Action 4 – Juvenile Protection: If triggered, the CVP and SWP may target upstream Old
6 and Middle River flow of up to 0 cfs in June. This action is estimated to reduce combined
7 project exports up to 130 taf in a dry year and up to 350 taf in an average year.

8 29. Action 5 - Barrier Operations: There were no additional export reductions associated
9 with this action.

10 **COMBINED SWP/CVP ESTIMATED DELIVERY REDUCTIONS**

11 30. I assumed in my analysis that both the SWP and CVP are equally responsible for meeting
12 the objectives in the Action Matrix. The estimated delivery reductions provided below represent
13 combined CVP/SWP delivery reductions.

14 31. Export reductions do not result in a one-for-one impact on deliveries because of a
15 multitude of complicating factors including system constraints, runoff patterns, annual delivery
16 patterns, and operational flexibility.

17 32. The export reductions for each action were entered into an operational spreadsheet
18 model developed by DWR staff that estimates the delivery capabilities of the SWP and CVP.
19 We modeled the remedy period with the implementation of the Action Matrix and without
20 implementation of the Action Matrix. A comparison of model output indicates what annual
21 delivery reduction could occur in 2008 if all proposed actions are implemented.

22 33. The resulting delivery reductions are expressed as a range for each hydrologic
23 assumption for the same reason that the export reductions were expressed as a range. Actions 3
24 and 4 of the Action Matrix have an adaptive management process that will vary the flow
25 objective.

26 34. The conclusion of the analysis is that the sum of all these export reductions in a dry year
27 is expected to decrease combined 2008 deliveries of the SWP and CVP by 6% (183 taf) to 25%
28 (814 taf) from a baseline delivery of 3.2 maf.

1 35. In an average year, the delivery reductions are expected to be between 14% (820 taf) to
2 37% (2.17 maf) from a baseline delivery of 5.9 maf.

3 **SWP SHARE OF ESTIMATED DELIVERY REDUCTIONS**

4 36. The analysis showed that the SWP 2008 annual deliveries would be reduced 8% (91 taf)
5 to 27% (305 taf) from a baseline delivery of 1.15 maf in a dry year.

6 37. In an average year, SWP 2008 annual deliveries would be reduced 8% (252 taf) to 31%
7 (940 taf) from a baseline delivery of 3 maf.

8 I declare under penalty of perjury under the laws of the State of California that the
9 foregoing is true and correct.

10 Executed this 9th day of July, 2007 at Sacramento, California

11
12 
13 JOHN LEAHIGH, Declarant.

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Department of Water Resources

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA

**NATURAL RESOURCES DEFENSE
COUNCIL, et al.,**

Plaintiffs,

v.

**DIRK KEMPTHORNE, in his official capacity
as Secretary of the Interior, et al.,**

Defendants,

**SAN LUIS & DELTA-MENDOTA WATER
AUTHORITY and WESTLANDS WATER
DISTRICT; CALIFORNIA FARM BUREAU
FEDERATION; GLENN-COLUSA
IRRIGATION DISTRICT, et al.;
CALIFORNIA DEPARTMENT OF WATER
RESOURCES, and STATE WATER
CONTRACTORS,**

Defendant-Intervenors.

05 CV 01207 OWW (LJO)

**CALIFORNIA DEPARTMENT OF
WATER RESOURCES'
MEMORANDUM OF POINTS AND
AUTHORITIES IN SUPPORT OF
AN INTERIM REMEDY**

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: Hon. Oliver W. Wanger

INTRODUCTION

The California Department of Water Resources (DWR) submits the following proposal for an interim remedy in accordance with the Endangered Species Act, 16 U.S.C. § 1531 et seq. In particular, DWR supports the proposed Delta Smelt Action Matrix for Water Year 2008 (Action

1 Matrix), developed by the United States Fish and Wildlife Service (USFWS) for the operation of
2 the Central Valley Project (CVP) and State Water Project (SWP) (collectively, the projects),
3 pending completion of reconsultation of the biological opinion for the impacts of the projects on
4 the delta smelt.

5 On February 16, 2005, the USFWS issued its Biological Opinion, determining that the
6 Operations Plan and Criteria (OCAP) for the CVP and SWP would not result in jeopardy to the
7 delta smelt (2005 BiOp). On May 20, 2005, plaintiffs filed their supplemental complaint,
8 challenging the adequacy the 2005 BiOp. On June 9, 2006, plaintiffs filed their Motion for
9 Summary Judgment. On July 6, 2006, in light of new information, the United States Bureau of
10 Reclamation requested that the USFWS reinitiate consultation on the OCAP. Notwithstanding
11 the request for reinitiation of consultation, the parties to this matter proceeded with briefing their
12 cross-motions for summary judgment and, on May 25, 2007, this court found that the 2005 BiOp
13 was inadequate and that the no jeopardy determination was arbitrary and capricious and contrary
14 to the law. On June 1, 2007, this court further ordered that the USFWS and DWR develop
15 proposals for operating the projects pending completion of the reconsultation.

16 DWR proposes that the SWP and CVP be operated in accordance with the Action Matrix,
17 jointly with USBR, until the new biological opinion is issued. Under the proposed remedy, SWP
18 and CVP operations are adjusted to maintain flows, as prescribed in the Action Matrix, in the
19 south delta channels of the Old and Middle rivers. Because the actions prescribed by the Action
20 Matrix require changes in both SWP and CVP operations, DWR's proposed remedy anticipates
21 that the Action Matrix will be coordinated with United States Bureau of Reclamation (USBR)
22 operations of the SCP and that the water supply impacts will be allocated equally between the
23 two projects, or as otherwise agreed upon by DWR and USBR.

24 STANDARD OF REVIEW

25 Under Section 7 of the ESA, agency actions may continue during the consultation process
26 where such actions are "non-jeopardizing" to the listed species. *Washington Toxics Coalition v.*
27 *Environmental Protection Agency*, 413 F.3d 1024, 1035 (9th Cir. 2005); *Oregon Natural*
28 *Resources Council v. Allen*, 476 F.3d 1031, 1040 (9th Cir. 2007). However, all agency actions

1 under this limitation need not be enjoined. For example, Ninth Circuit has allowed federally
 2 authorized cattle grazing where such activity would have “little” impact on the listed species.
 3 *Southwest Center for Biological Diversity v. U. S. Forest Service*, 307 F.3d 964, 973-974 (9th Cir.
 4 2002) *withdrawn as moot*, 355 F.3d 1203 (9th Cir. 2004); *Defenders of Wildlife v. Martin*, 454
 5 F.Supp.2d 1085, 1096-1097 (E.D. Wash. 2006) [affirming the reasoning of both majority and
 6 dissenting opinions in *Biological Diversity* on this point notwithstanding “the opinion’s later
 7 withdrawal.”]; *See also North Slope Borough v. Andrus*, 486 F.Supp 332, 357 (D.D.C. 1980).

8 In addition, under section 7(d) of the ESA, the agency action cannot “make any irreversible
 9 or irretrievable commitment of resources . . . which has the effect of foreclosing the formulation
 10 or implementation of any reasonable and prudent measures” during the consultation process. 16
 11 U.S.C. § 1536(d); *Sierra Club v. Marsh*, 816 F.2d 1376, 1389 (9th Cir. 1987); *Washington Toxics*,
 12 *supra*, 413 F.3d at 1035 [distinguishing between the “irreversible and irretrievable commitment”
 13 and the “non-jeopardizing” requirements.] However, like the “non-jeopardizing” requirement,
 14 the section 7(d) ban on the “irreversible and irretrievable commitment of resources” also does not
 15 prohibit all agency action during the consultation process. *Sierra Club v. Marsh, supra*, 816 F.3d
 16 at 1389 [Highway construction work allowed to continue where section 7(d) requirements are
 17 met.]; *Bays Legal Fund v. Browner*, 828 F.Supp. 102, 112, n.24 (D. Mass. 1993) [Continued
 18 construction of sewage outfall held consistent with section 7(d).]; *Comm. of Mass. v. Andrus*, 481
 19 F.Supp. 685, 691 (D.Mass. 1979) [Oil lease sale held consistent with section 7(d).]

20 Lastly, settled authority grants district courts with discretion during the consultation period
 21 to “narrowly tailor” their injunctive remedies. *National Wildlife Federation v. National Marine*
 22 *Fisheries Service*, 422 F.3d 782, 799-800 (9th Cir. 2005). Where “specific information” justifies
 23 a more limited injunction than requested by the plaintiffs, “the Court must tailor the relief
 24 ordered.” *Defenders of Wildlife, supra*, 454 F.Supp.2d at 1099-1100; *Natural Resources Defense*
 25 *Council v. Evans*, 364 F.Supp.2d 1083, 1143 (N.D.Cal. 2003) [a “tailored injunction” does not
 26 require the ban of all sonar use in areas populated by marine life]; *Strahan v. Pritchard*, 473
 27 F.Supp.2d 230, 240-241 (D. Mass. 2007) [broad injunction banning certain fishing gear held to
 28 be “unwarranted”].

1 As the Ninth Circuit has noted in reviewing the adequacy of reasonable and prudent
 2 alternatives under the ESA, "the Secretary [of the Interior] was not even required to pick the best
 3 alternative or the one that would most effectively protect the Flycatcher from jeopardy . . . [t]he
 4 Secretary need only have adopted a final RPA which complied with the jeopardy standard and
 5 which could be implemented by the agency." *Southwest Center for Biological Diversity v. U. S.*
 6 *Bureau of Reclamation*, 143 F.3d 515, 523 (9th Cir. 1998). As the following will show, the
 7 interim remedy proposal prepared by the U.S. Fish and Wildlife Service and adopted by DWR
 8 fully comports with the "non-jeopardizing" and "irreversible and irretrievable commitment"
 9 requirements of the ESA. Finally, the interim remedy proposal is "narrowly tailored" to
 10 minimize the proposal's impacts on other beneficial uses of CVP and SWP water.

11 ARGUMENT

12 I. THE INTERIM REMEDY FULLY COMPORTS WITH THE REQUIREMENTS OF 13 THE ENDANGERED SPECIES ACT.

14 For the last several months, USFWS has been working with the California Department of
 15 Fish and Game (DFG), the National Marine Fisheries Service, the U.S. Bureau of Reclamation
 16 (USBR), and DWR to develop actions to minimize and prevent adverse impacts to delta smelt
 17 and its habitat from SWP and CVP operations during the interim period pending completion of
 18 the consultation on the delta smelt with the USFWS. DWR is informed and believes that the
 19 USFWS will complete the consultation process on or about August, 2008. Using the best
 20 scientific data available, the USFWS has prepared a series of protective fish actions set forth in a
 21 matrix entitled "Delta Smelt Action Matrix for Water Year 2008" (Action Matrix). Declaration
 22 of Jerry Johns (Johns Dec.) at ¶¶ 6 & 7 and Exhibit A. DWR respectfully submits that SWP and
 23 CVP operations in furtherance of the Action Matrix will not likely jeopardize the continued
 24 existence of the delta smelt, nor adversely modify its critical habitat during the consultation
 25 period. Moreover, DWR's operation of the SWP consistent with the Action Matrix will not
 26 result in any irreversible or irretrievable commitment of resources that would foreclose the
 27 USFWS from adopting any reasonable and prudent alternative measures in its final biological
 28 opinion. Johns Dec. at ¶ 60.

1 **A. Action 1 - Winter Pulse Flow and Adult Spawning**

2 Both Actions 1 and 2 are premised upon a statistical relationship between the net flow in
3 Old and Middle rivers and SWP and CVP salvage of delta smelt at the projects' respective
4 pumping facilities. According to research conducted by scientists in the Delta Smelt Working
5 Group and analysis prepared by USBR biologist Dr. Mike Chotkowski, project salvage of adult
6 smelt typically begins after the first large storm event in or after late December. The pulse of
7 fresh water from this storm event, the turbidity that it carries into the Delta, or some other related
8 factors appear to stimulate movement of the adult smelt to upstream spawning areas. Normally,
9 adult smelt are found in turbid waters and are not found in clear water. Johns Dec. at ¶ 26.

10 Under the Action 1, DWR and USBR would reduce SWP and CVP winter pumping for a
11 10-day period after the first storm event pulse flow, thus reducing net negative flow in Old and
12 Middle rivers to no greater than 2,000 cubic feet per second (cfs). The action would be triggered
13 on or after December 25th, based upon turbidity reaching a threshold level at locations in the
14 Delta. The purpose of this action would be to allow the downstream turbidity plume to pass out
15 of the Delta and to avoid its dispersal into the central and southern Delta. The action would
16 increase the likelihood that spawning adult smelt would move into the Sacramento River system
17 and away from the influence of the project pumps, rather than spawn in the central or southern
18 Delta. Johns Dec. at ¶ 27. The projects would not implement this action in high flow
19 Sacramento river water years, given that in such high flow years the delta smelt likely would be
20 moved into Suisun Bay and away from the pumps' influences. *Id.* at ¶ 28.

21 **B. Action 2 - Adult Salvage Minimization**

22 Action 2 would commence after completion of Action 1 or beginning January 15th, unless
23 the Sacramento river system was experiencing a high flow water year. Action 2 would require
24 DWR and USBR to reduce SWP and CVP pumping so that the net upstream flow towards the
25 project pumps on Old and Middle rivers would not exceed a 14-day running average of 4,500 cfs.
26 Johns Dec., Exhibit A. By reducing net upstream (or negative) flow in Old and Middle rivers,
27 the action would protect delta smelt habitat and reduce entrainment risks at the project pumps.
28 Both the U.S. Geological Service and DWR scientists have found a statistical relationship

1 between negative winter flow in Old and Middle rivers and the salvage of smelt at the project
2 pumps. Johns Dec. at ¶ 34. In reviewing historical data for January and February, DWR has
3 found a significant increase in project salvage when negative flows in Old and Middle rivers
4 exceed 6,000 cfs during these months. Johns Dec., Exhibits B and C. A prescriptive standard
5 limiting negative flow to a 14 day running average of 4,500 cfs would therefore likely minimize
6 adult smelt entrainment at the project pumps. *Id.*, at ¶ 34. This action would terminate at the
7 onset of spawning, and would be followed by Action 3.

8 C. Action 3 - Larval and Juvenile Protection

9 DWR and USBR would implement Action 3 in March, April, and May at the onset of smelt
10 spawning. Spawning typically occurs when Delta water temperatures reach 12 degrees Celsius.
11 Johns Dec. at ¶ 37. Under this action DWR and USBR would reduce SWP and CVP pumping so
12 that negative flow in Old and Middle rivers would meet a target daily flow of between zero and
13 4,000 cfs. *Id.* at ¶ 35 and Exhibit A. The scientific basis for Action 3 is similar to the basis for
14 Action 2 and is supported by recent research conducted by Dr. Bennett of the U.C. Davis Bodega
15 Marine Lab regarding the benefit to the smelt of reduced exports during March and April. *Id.* at ¶
16 36.

17 The USFWS will implement the zero to 4,000 cfs negative flow prescriptive standard based
18 upon the adaptive management protocols set forth in Attachment A to the Action Matrix. Johns
19 Dec., Exhibit A and Attachment A thereto. The protocols will determine the target flows based
20 upon real time data regarding spawning distribution and the susceptibility of the smelt population
21 to SWP and CVP pumping operations. The Spring Kodiak Trawl and the 20-mm Survey,
22 surveys conducted by DFG, will be used to estimate smelt distribution in the Delta.
23 A Particle Tracking Model (PTM) will be used to determine smelt susceptibility to project
24 pumping. Johns Dec. at ¶ 38. Where the distribution surveys and the PTM demonstrate on a real
25 time basis a high risk of smelt entrainment, then the recommended negative flow in Old and
26 Middle rivers would likely be closer to zero. Where the real time data disclosed a lower risk of
27 entrainment, then the recommended negative flow would likely be closer to 4,000 cfs. Johns
28 Dec., Exhibit A and Attachment A thereto. This action would end when entrainment risks have

1 abated as determined by the procedures set forth in Attachment B to the Action Matrix, or June
2 1st, whichever is earlier. Johns Dec. ¶ 40 and Exhibit A and Attachment B thereto.

3 C. Action 4 - Juvenile Protection

4 Under Action 4, DWR and USBR will alter SWP and CVP operations based upon real time
5 data. Specifically, the USFWS, using the Delta Smelt Working Group and the Water Operations
6 Management Team process as described in Attachment B to the Action Matrix, will set forth
7 operational parameters based upon smelt distributional surveys such as the Spring Kodiak Trawl
8 and the 20 mm survey and the estimated impact of project operations on the smelt as determined
9 by the PTM. Factors such as rising water temperatures and increased local diversions may also
10 be considered in setting operational parameters. Johns Dec. at ¶ 41 and Exhibit A and
11 Attachment B thereto. Action 4 will begin on June 1st and will end when USFWS determines
12 that the risk of entrainment of juveniles has been abated. *Id.*

13 D. Action 5 - Head Of Old River Barrier And Agricultural Barriers

14 Action 5 would preclude DWR from installing the Head of Old River Barrier and to open
15 the flap gates on certain rock barriers installed by DWR in the Delta. This action would occur
16 from mid-April through to mid-May. The purpose of this action would be to increase the amount
17 of San Joaquin River water flowing into Old River, thus improving river flow and decreasing the
18 risk of smelt entrainment at the project pumps. Johns. Dec. at ¶ 45.

19 E. Summary

20 DWR respectfully submits that the current decline of the delta smelt is likely due to
21 numerous factors, of which CVP and SWP operations account for only a portion of that decline.
22 As the Johns declaration discloses, numerous stressors such as invasive species and toxic events
23 may account for a portion of the recent decline in smelt abundance. Johns Dec. at ¶¶ 49-59.
24 Notwithstanding these facts, DWR contends that the fish action measures set forth in the
25 USFWS' Action Matrix will likely ensure that SWP and CVP operations will not jeopardize the
26 delta smelt or adversely modify its critical habitat during the interim consultation period. Long-
27 term measures for the protection of the smelt and its habitat, of course, await the final USFWS'
28 biological opinion.

1 **II. WATER COSTS ASSOCIATED WITH IMPLEMENTATION OF THE ACTION**
2 **MATRIX.**

3 As described above, the Action Matrix contemplates significant restrictions on pumping
4 during times of the year critical to the delta smelt. These restrictions will result in equally
5 significant water costs to the projects and the contractors.

6 Water costs refer to the estimated reductions in exports and deliveries resulting from
7 implementation of the Action Matrix. Declaration of John Leahigh in Support of the California
8 Department of Water Resources' Interim Remedy Proposal (Leahigh Dec.) at ¶ 8. Water supply
9 forecasting requires a projection of initial reservoir storage and forecasted runoff as a foundation
10 for delivery estimates. Leahigh Dec. at ¶10. Forecasted runoff is dependent on the amount of
11 precipitation that will be experienced the following year, which is highly variable. *Id.* Therefore,
12 water supply costs were analyzed for 2008 using two different assumptions about the amount of
13 precipitation that may be experienced in 2008: dry and average. Leahigh Dec. at ¶¶ 10-13. All
14 estimates were made based on the assumption that the SWP and CVP will be equally responsible
15 for meeting the objectives of the Action Matrix. Leahigh Dec. at ¶ 30.

16 **A. Estimated Export Reductions.**

17 Estimated export reductions under the Action Matrix are substantial. Under one scenario,
18 exports could be reduced by up to 1.3 million acre-feet (maf). Leahigh Dec. at ¶ 27. Ensuring
19 that upstream Old and Middle River flows do not exceed 2,000 cfs during Action 1 for a 10-day
20 period between December 25 and early January is estimated to reduce combined project exports
21 by 100 thousand acre-feet (taf) in a dry year and 160 taf in an average year. Leahigh Dec. at ¶ 25.
22 Ensuring that upstream flows at Old and Middle Rivers do not exceed a 14-day running average
23 of 4,500 cfs over several weeks during Action 2 is estimated to reduce combined exports by 150
24 taf in a dry year and 500 taf in an average year. Leahigh Dec. at ¶ 26.

25 As described above, Actions 3 and 4 anticipate a range of flows between zero and 4,000 cfs
26 14-day running average, depending on real-time monitoring data. Under Action 3, which
27 provides that flows shall not exceed 4,000 cfs between late February through the end of May, the
28 estimated reductions are between 60 taf and 500 taf in a dry year, and as much as 1.3 million

1 acre-feet (maf) in an average year. Leahigh Dec. at ¶ 27. Under Action 4, if the target upstream
2 Old and Middle River flows is zero cfs in June, estimated reductions are projected to be up to
3 130 taf in a dry year and 350 in an average year. Leahigh Dec. at ¶ 28. However, if Action 4 is
4 never triggered, as discussed above, there will be no water costs associated with this Action.
5 Leahigh Dec. at ¶ 22. No additional export reductions are associated with Action 5. Leahigh
6 Dec. at ¶ 29.

7 **B. Estimated Delivery Reductions.**

8 As a direct result of the export reductions resulting from implementation of the Action
9 Matrix, deliveries to the water contractors also will be significantly reduced. DWR alone
10 provides water to 29 contractors throughout California under water right permits issued by the
11 State Water Resources Control Board. Leahigh Dec. at ¶ 14. In a dry year, under baseline
12 operations, SWP delivers approximately 1.15 maf.¹ Leahigh Dec. at ¶ 36. In an average year,
13 SWP delivers approximately 3 maf. Leahigh Dec. at ¶ 37. With the export reductions identified
14 above, SWP's deliveries would be reduced to between eight percent (91 taf) to 27 percent (305
15 taf) in a dry year or between 8 percent (252 taf) to 31 percent (940 taf) in an average year.
16 Leahigh Dec. at ¶ 36 and 37.

17 Because DWR anticipates that the actions under the Action Matrix will be implemented
18 jointly by DWR and USBR and that both projects will share equally in the water supply costs
19 associated with the actions, DWR also estimated the total delivery reductions for the combined
20 operations of the SWP and CVP. Johns Dec. at ¶ 9; Leahigh Dec. at ¶ 30. In a dry year, the
21 combined operations deliver approximately 3.2 maf. Leahigh Dec. at ¶ 34. In an average year,
22 the combined operations deliver approximately 5.9 maf. Leahigh Dec. at ¶ 35. DWR has
23 concluded that, in a dry year, the delivery reductions for the combined operations of the projects
24 will be between six percent (183 taf) to 25 percent (814 taf) and that in an average year, delivery
25 reduction will be between 14 percent (820 taf) and 37 percent (2.71 maf).

26
27
28 1. Export reductions do not result in a one-for-one impact on deliveries because of a
multitude of complicating factors, including system constraints, runoff patterns, annual delivery
patterns, and operational flexibility. Leahigh Dec. at ¶ 31.

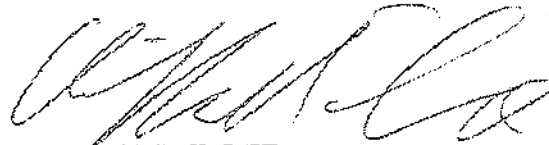
CONCLUSION

For the foregoing reasons, the California Department of Water Resources respectfully requests that this court adopt DWR's proposed interim remedy as set forth above.

Dated: July 9, 2007

Respectfully submitted,

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10 IN THE UNITED STATES DISTRICT COURT
11 FOR THE EASTERN DISTRICT OF CALIFORNIA

12 **NATURAL RESOURCES DEFENSE**
13 **COUNCIL, et al.,**

14 Plaintiffs,

15 v.

16 **DIRK KEMPTHORNE, in his official capacity**
as Secretary of the Interior, et al.,

17 Defendants,
18

19 **SAN LUIS & DELTA-MENDOTA WATER**
AUTHORITY and WESTLANDS WATER
20 **DISTRICT; CALIFORNIA FARM BUREAU**
FEDERATION; GLENN-COLUSA
21 **IRRIGATION DISTRICT, et al.;**
CALIFORNIA DEPARTMENT OF WATER
22 **RESOURCES, and STATE WATER**
CONTRACTORS,

23 Defendant-Intervenors.
24

05 CV 01207 OWW (LJO)

DECLARATION OF JOHN
LEAHIGH IN SUPPORT OF THE
CALIFORNIA DEPARTMENT OF
WATER RESOURCES'
PROPOSED INTERIM REMEDY

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: Hon. Oliver W. Wanger

25 I, John Leahigh, declare as follows:

26 1. I am employed by the Department of Water Resources (DWR) as Chief of the Project
27 Operations Planning Branch (POPB) within the Division of Operations and Maintenance. I have
28 been in my current position since March 2005.

1 2. I am responsible for short-term planning of water operations for the State Water Project
2 (SWP). These planning responsibilities include the estimation of delivery capabilities of the SWP
3 and forecasted water export operations from the Sacramento/San Joaquin Delta (Delta) through the
4 Harvey O. Banks Delta Pumping Plant (Banks), Skinner Fish Protection Facility (Skinner), and
5 Clifton Court Forebay (CCF).

6 3. Prior to taking the position of Chief of the POPB, I worked within the branch in various
7 engineering classifications from November 1996 through February 2005. I have worked for DWR
8 since May 1992. I received a Bachelor's degree in Civil Engineering from the University of New
9 Mexico in 1989 and a Master's degree in Civil Engineering with emphasis on Water Resources
10 Engineering from California State University at Sacramento in 1999. I am a registered Civil
11 Engineer in the State of California.

12 4. One of my responsibilities as Chief of the POPB is to supervise the work of engineering
13 staff that develop and monitor studies, projections and delivery capabilities of the SWP. I coordinate
14 with a team of engineers to plan and schedule water export operations based on water availability,
15 water permit/quality restrictions, environmental needs, and projected hydrology.

16 5. I have personal knowledge of the facts stated herein, and, if called to do so, could and
17 would testify competently thereto.

18 6. I am familiar with and contributed to the development of the proposed remedy actions, set
19 forth in the Delta Smelt Action Matrix for Water Year 2008 (Action Matrix)^{1/}, proposed by the
20 United States Fish and Wildlife Service (USFWS), as supported by DWR. The Action Matrix has
21 been developed to minimize and prevent adverse impacts to delta smelt and its habitat from SWP
22 and CVP operations during the interim period pending completion of the consultation on the delta
23 smelt with USFWS. I am informed and believe that the USFWS will complete the consultation and
24 issue its biological opinion before August 2008.

25 ///

26

27

28 1. A copy of the Action Matrix is attached as Exhibit A to the Declaration of Jerry Johns in
Support of the California Department of Water Resources' Proposed Interim Remedy, filed
concurrently herewith.

1 7. I have worked with POPB staff to develop an estimate of the water costs associated with
2 implementation of the Action Matrix through July 2008.

3 8. For the purposes of the following analysis, "water costs" are defined as the estimated
4 export reductions and the estimated reductions in deliveries of water to CVP/SWP contractors
5 for 2008 as a result of implementing the actions described in the Action Matrix.

6 9. The term "baseline" is defined as the expected delivery of water without implementing the
7 Actions proposed in the USFWS remedy matrix. Baseline water deliveries often vary depending
8 on hydrology and the costs estimates are based on two different hydrology assumptions, as
9 described in detail below.

10 10. Water supply forecasting requires a projection of initial reservoir storages and forecasted
11 runoff as a foundation to delivery estimates. Reliable projections are available for the initial
12 reservoir storages going into 2008, but the forecasted runoff is largely dependent on the amount
13 of precipitation that will be experienced next year, which is unknown and could vary greatly.
14 Water supply costs were analyzed for 2008 with two different assumptions on the amount of
15 precipitation that may be experienced in 2008: dry and average.

16 11. A year with low precipitation or a "dry year" for the purposes of my analysis assumes the
17 amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded
18 90% of the time over the past 85 years.

19 12. A year with average precipitation or an "average year" for the purposes of my analysis
20 assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was
21 exceeded 50% of the time over the past 85 years.

22 13. Although many different assumptions could be made for the amount of precipitation that
23 could occur in any year, assumptions of precipitation at a 90% and 50% chance of exceedence
24 are the most widely used water supply forecasting assumptions. These two hydrologic
25 assumptions generally give a good analytical range for project operations.

26 **EXISTING RESTRICTIONS ON WATER DELIVERIES**

27 14. DWR provides water to twenty-nine (29) contractors throughout California under water
28 right permits issued by the State Water Resources Control Board (SWRCB). These permits

1 include restrictions on water exports. The DWR permit most recently issued by the SWRCB
2 resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the
3 decision can be found at 14. DWR provides water to twenty-nine (29) contractors throughout
4 California under water right permits issued by the State Water Resources Control Board
5 (SWRCB). These permits include restrictions on water exports. The DWR permit most recently
6 issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641
7 (D-1641). Details of the decision can be found at
8 <http://www.waterrights.ca.gov/baydelta/dl1641.htm>.

9 15. The water costs associated with the Action Matrix are measured against allowable
10 deliveries under baseline operations, considering all flow and water quality objectives required
11 by D-1641. Through D-1641, the SWRCB assigns responsibility for meeting water quality
12 objectives adopted in the Water Quality Control Plan ("WQCP") for the San Francisco
13 Bay/Sacramento-San Joaquin Delta Estuary. These WQCP objectives protect fish and wildlife,
14 and the agricultural, municipal and industrial uses of water.

15 16. The WQCP was updated in 2006. The new plan did not result in any changes in the
16 requirements of D-1641. The new WQCP can be found at
17 <http://www.waterrights.ca.gov/baydelta/docs/rev2006wqcp.pdf>.

18 17. A team of engineers and I took into account the restrictions imposed by meeting the
19 objectives of the WQCP when developing the estimates for water costs associated with the
20 implementation of the Action Matrix.

21 **ASSUMPTIONS FOR THE IMPLEMENTATION OF ACTIONS**

22 18. I assumed in the analysis that Action 1 would be triggered and implemented as of
23 December 25, 2007 and continue through January 3, 2008. December 25 is described as the first
24 possible day to trigger this 10-day Action in the Action Matrix.

25 19. I assumed in the analysis that delta smelt spawning will occur on February 20, 2008.
26 February 20 is the date on which DWR biologists have estimated that spawning has begun
27 historically. This assumption establishes the durations of Actions 2 and 3, which could vary
28 significantly. The end of Action 2 and the trigger for the start of Action 3 is the onset spawning

1 as described in the Action Matrix.

2 20. In the Action Matrix, Actions 3 and 4 assume a range of flow objectives. A range of Old
3 and Middle River upstream flows between 0 and 4000 cubic feet per second (cfs) is explicitly
4 described and assumed for analyzing Action 3.

5 21. Action 4 does not have targeted flow but allows a range similar to Action 3 (from zero to
6 approximately 4000 cfs).

7 22. Because the Action Matrix describes Actions 3 and 4 flow objectives as a range I
8 assumed a range for water costs as well. The high end of this range assumes that the Old and
9 Middle River objective is 0 cfs for both Actions 3 and 4. For determining the lower costs in the
10 range I assumed that Action 3 is implemented at the 4000 cfs flow objective and Action 4 is not
11 triggered, resulting is no water costs.

12 23. This range of cost was necessary as part of the analysis because of the uncertainty
13 related to the real-time distribution of delta smelt and the susceptibility of this distribution to the
14 exports as noted in footnotes of the Action Matrix.

15 **ESTIMATED EXPORT REDUCTIONS**
16 **ASSOCIATED WITH THE USFWS'S REMEDY PROPOSAL**

17 24. Implementation of flow objectives in the Action Matrix will require reductions in export
18 operations by the SWP and CVP. My team of engineers and I estimated ranges of export
19 reductions associated with each Action in the Action Matrix. The ranges are based on 2008
20 being dry or having average precipitation as defined earlier. In addition, Actions 3 and 4 have
21 sub-ranges due to their adaptive nature.

22 25. Action 1 - Winter Pulse Flow to Benefit Adult Spawning: CVP and SWP target upstream
23 Old and Middle River flow not to exceed 2,000 cfs for a 10-day period during late December or
24 early January. This action is estimated to reduce combined project exports by 100 thousand
25 acre-feet (taf) in a dry year and 160 taf in an average year.

26 26. Action 2 - Adult Salvage Minimized: CVP and SWP target upstream Old and Middle
27 River flow not to exceed 4,500 cfs from early January to late February. This action is estimated
28 to reduce combined project exports by 150 taf in a dry year and 500 taf in an average year.

1 27. Action 3 – Larval and Juvenile Protection: CVP and SWP target upstream Old and
 2 Middle River flow between 4,000 cfs to 0 cfs from late February through the end of May. This
 3 action is estimated to reduce combined project exports by 60 taf to 500 taf in a dry year and 640
 4 taf to 1.3 million-acre feet (maf) in an average year.

5 28. Action 4 – Juvenile Protection: If triggered, the CVP and SWP may target upstream Old
 6 and Middle River flow of up to 0 cfs in June. This action is estimated to reduce combined
 7 project exports up to 130 taf in a dry year and up to 350 taf in an average year.

8 29. Action 5 - Barrier Operations: There were no additional export reductions associated
 9 with this action.

10 **COMBINED SWP/CVP ESTIMATED DELIVERY REDUCTIONS**

11 30. I assumed in my analysis that both the SWP and CVP are equally responsible for meeting
 12 the objectives in the Action Matrix. The estimated delivery reductions provided below represent
 13 combined CVP/SWP delivery reductions.

14 31. Export reductions do not result in a one-for-one impact on deliveries because of a
 15 multitude of complicating factors including system constraints, runoff patterns, annual delivery
 16 patterns, and operational flexibility.

17 32. The export reductions for each action were entered into an operational spreadsheet
 18 model developed by DWR staff that estimates the delivery capabilities of the SWP and CVP.
 19 We modeled the remedy period with the implementation of the Action Matrix and without
 20 implementation of the Action Matrix. A comparison of model output indicates what annual
 21 delivery reduction could occur in 2008 if all proposed actions are implemented.

22 33. The resulting delivery reductions are expressed as a range for each hydrologic
 23 assumption for the same reason that the export reductions were expressed as a range. Actions 3
 24 and 4 of the Action Matrix have an adaptive management process that will vary the flow
 25 objective.

26 34. The conclusion of the analysis is that the sum of all these export reductions in a dry year
 27 is expected to decrease combined 2008 deliveries of the SWP and CVP by 6% (183 taf) to 25%
 28 (814 taf) from a baseline delivery of 3.2 maf.

1 35. In an average year, the delivery reductions are expected to be between 14% (820 taf) to
2 37% (2.17 maf) from a baseline delivery of 5.9 maf.

3 **SWP SHARE OF ESTIMATED DELIVERY REDUCTIONS**

4 36. The analysis showed that the SWP 2008 annual deliveries would be reduced 8% (91 taf)
5 to 27% (305 taf) from a baseline delivery of 1.15 maf in a dry year.

6 37. In an average year, SWP 2008 annual deliveries would be reduced 8% (252 taf) to 31%
7 (940 taf) from a baseline delivery of 3 maf.

8 I declare under penalty of perjury under the laws of the State of California that the
9 foregoing is true and correct.

10 Executed this 9th day of July, 2007 at Sacramento, California

11
12 
13 JOHN LEAHIGH, Declarant.

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EXHIBITS

Exhibit A

USFWS Delta Smelt Action Matrix for Water Year 2008 (7/3/07)

Action #	Timing	Life stage	Action	Triggers	End of Action	Benefits to delta smelt
1	Winter	Adults	Within 3 days of the trigger, achieve an average net daily upstream Old and Middle River (OMR) flow not to exceed 2,000 cfs for a 10-day period (one time action). ¹	On or after December 25 contingent on when turbidity threshold is greater than 12 Nephelometric Turbidity Unit at Prisoners Point, Holland Tract, or Victoria Island unless the three-day average Sacramento River flow at Freeport is greater than 80,000 cfs during the period	After 10 days or if the three-day Sacramento River flow at Freeport increases to greater than 80,000 cfs during the 10 days, or the onset of spawning ² or when water temperature reach 12°C ³	Pulse flow for pre-spawning adult smelt to minimize movement into the south delta where they would be entrained and their offspring would also be entrained. ⁴ The goal is to maximize the number of smelt that spawn north of the confluence where their offspring are less susceptible to entrainment at the facilities.
2	Winter	Adults	Daily net upstream OMR not to exceed 4,500 cfs ⁵ . The flow will be a 14-day running average. Simultaneously, the 7-day running average will not exceed 5,000 cfs.	Immediately following action #1 or beginning January 15 unless the three-day average Sacramento River flow at Freeport is greater than 80,000 cfs	The onset of spawning ² or when delta water temperatures reach 12°C ³	To minimize the number of pre-spawning adult smelt entrained at the facilities and to avoid spawning in the south delta where their offspring could be entrained.
3	Winter/ Spring	Larval/ Juvenile	Target daily net upstream OMR flow of 0-4,000 cfs ⁶ . As described in Attachment A to this Exhibit, actual flow to be determined based on the real-time data estimating spawning distribution and the susceptibility of a substantial portion of the population to the effects of Project operations based on particle tracking model results or other real time data. The flow will be a 14-day running average. Simultaneously, the 7-day running average shall be within 500 cfs of the applicable 14-day running average	Initiate the action at the onset of spawning ² or when water temperatures reach 12°C ³ . This action may be modified or unnecessary if the distribution of spawning delta smelt, larvae and juveniles is not occurring south or east of Frank's Tract and flows in the Yolo Bypass have reached the lower end of the Bypass.	Until entrainment risk is abated (see Attachment B to this Exhibit) or June 1, whichever occurs first ⁷	To minimize the number of larval smelt entrained at the facilities.
4	Spring/ Summer	Juvenile	Evaluation of real-time delta smelt data to recommend an action to protect juvenile smelt.	Based on real-time information, starting June 1. Evaluation of conditions to start Action 4 will begin May 15.	Until entrainment risk abated (see Attachment B to this Exhibit) or June 30	Potentially provide additional protections to delta smelt. Effects to listed salmon, steelhead and green sturgeon will be incorporated into the decision making process
5	Spring	Larval/ Juvenile	No installation of Spring Head of Old River Barrier and flap gates tied open on south delta agricultural barriers	31 day period of increased San Joaquin River inflow and reduced export pumping outlined in Water Rights	End of VAMP ⁸	To allow a greater proportion of the San Joaquin River to contribute to a more positive OMR flow to allow smelt to move to the confluence ⁹

Exhibit A
USFWS Delta Smelt Action Matrix for Water Year 2008 (7/3/07)

Footnotes:

- 1 Action #1 may be the first action or it may follow or be concurrent with Action #2.
- 2 The onset of spawning is indicated by the presence of spent females collected in Spring Kodiak Trawl OR at the salvage facilities.
- 3 Delta water temperature will be determined based on a three station average of the water temperatures at the Mossdale, Antioch and Rio Vista monitoring stations.
- 4 A pulse flow based on the "first flush" conceptual model, developed by the DSWG in meeting notes from 10/10/06 but based on salvage triggers (an analysis prepared by Dr. Mike Chotkowski, USBR unpublished data available from the author or from the Service) and Particle Tracking Modeling (PTM).
- 5 Net upstream OMR flow is based on Peter Smith's (PE, USGS) relationship (unpublished data available from the author or from the Service).
- 6 Typically, the range of 0 to 4,000 cfs would be the net upstream OMR flow.
- 7 VAMP conditions as described in Water Rights Decision 1641 are assumed to occur during this period.
- 8 Based on PTM produced for the DSWG by DWR modeling staff-see DSWG notes 3/26/07 at http://www.fws.gov/sacramento/es/delta_smelt.htm

Attachment A of Exhibit A
Process for determining target Old and Middle River flow for Action #3

In order to determine the appropriate target between 0 and 4000 cfs Old and Middle River (OMR) net upstream flow to protect delta smelt under Action #3, the following process will be followed:

1. The Service will convene the Delta Smelt Working Group (DSWG) to provide biological information, including a preliminary recommendation, to the Service.
2. The DSWG will examine real time information on delta smelt and delta environmental conditions to determine what OMR flow would be adequate to protect delta smelt. The real time information to be considered will include:
 - a. Real time delta smelt distribution data from Spring Kodiak Trawl Survey sampling, 20 mm Survey sampling or other monitoring data,
 - b. Salvage information from the CVP and SWP facilities,
 - c. Particle tracking models based on delta smelt distribution as inferred from the most recent monitoring surveys, and the best available forecast of Delta hydrology, including projected river flows and export rates,
 - d. Delta temperature data: When delta water temperatures reach 12° C, this serves as an indicator of the onset of spawning. The time period that water temperatures are between 12° C and 18° C can give an indication of the length of the spawning window. The expected number of delta smelt cohorts for the year can be inferred from an examination of survey and temperature information,
 - e. Number and pattern of delta smelt collected in the monitoring surveys,
 - f. Other biological data not described above.

The DSWG will determine based on this information where the majority of delta smelt are most likely to occur and the net OMR flow to avoid or minimize entrainment of delta smelt and provide a preliminary recommendation to the Service.

3. The Service will provide its preliminary recommendation to the Water Operations Management Team (WOMT) as to what OMR flow or other protective actions that would be needed to protect larval and juvenile delta smelt for discussion at WOMT. The WOMT includes the Department of Water Resources, the U.S. Bureau of Reclamation, the California Department of Fish and Game, and the National Marine Fisheries Service, and the Service, that are represented by each agency's director. Additional biological or hydrological information not described above may also be considered useful to the decision-making process by the Service in development of its preliminary recommendation to WOMT.

4. If WOMT agrees with the Service's recommendation, the Project Agencies implement the Service's recommendation. If WOMT does not agree with the Service's recommendation, WOMT will propose an operational response.

In the event of disagreement, the Project Agencies will provide additional information about operational constraints to the Service. Any WOMET agency can provide additional information to the Service.

The Service either concurs with the Project Agencies' proposed operations or notifies the Project Agencies that implementation of the Service-proposed modification of operations is necessary to adequately protect the delta smelt.

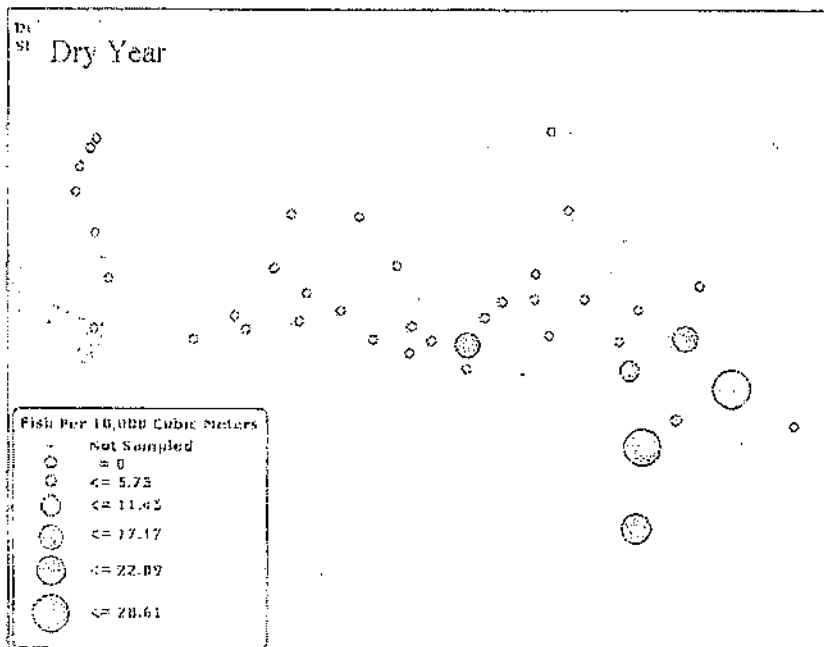
The Service retains the right to recommend additional actions based on real time conditions.

5. As conditions change, the DSWG and the Service will continuously evaluate conditions and reassess the operative OMR flow and the Service will adjust the requirement if it is determined that additional protection is needed or if less protection is warranted.

6. The following examples show three different distributions of delta smelt and generalized hydrologic conditions that illustrate the process for determining the approximate OMR flow necessary to avoid or minimize entrainment. The examples approximate a dry year, a moderate water year and a wet year. Please note that these examples are hypothetical and do not constitute an exhaustive description of conditions and recommendations that could be expected to occur.

Examples for Action 3

Example 1



Hydrology:

Sacramento River Flow of 15,000 cfs

San Joaquin River Flow of 900 cfs

Assumptions:

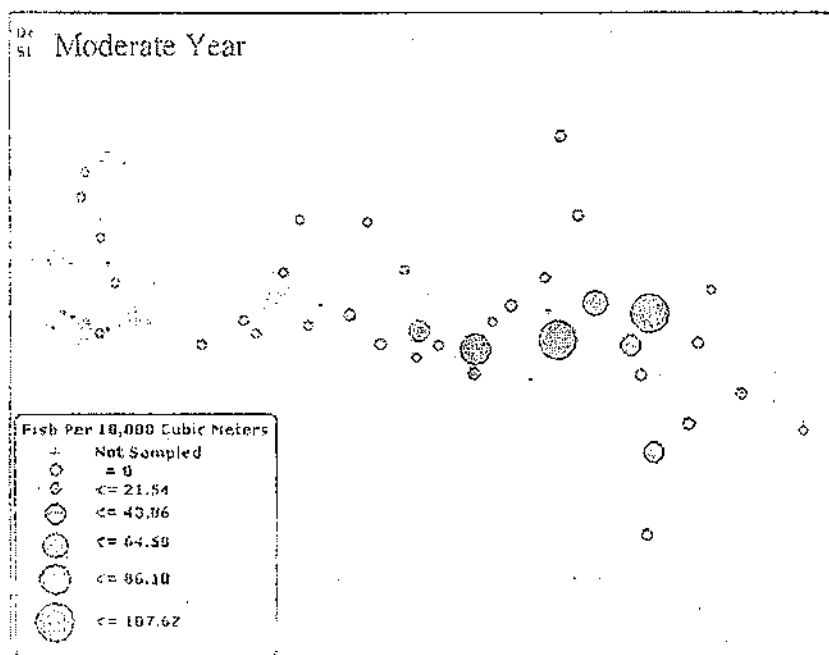
Pumping rate of 6,000 combined exports

Previous fall midwater trawl recovery index: 45

Potential Actions:

Under this example, with a distribution centered in the central and south Delta and a low previous year's fall midwater trawl index, concern would be extremely high. Particle tracking modeling would likely predict a very high risk of entrainment at the facilities under these conditions, and a net upstream OMR flow closer to 0 would likely be recommended to avoid or minimize entrainment. Operational and hydrological limitations may limit the ability to fully meet this recommendation.

Example 2



Hydrology:

Sacramento River Flow of 30,000 cfs

San Joaquin River Flow of 5,000 cfs

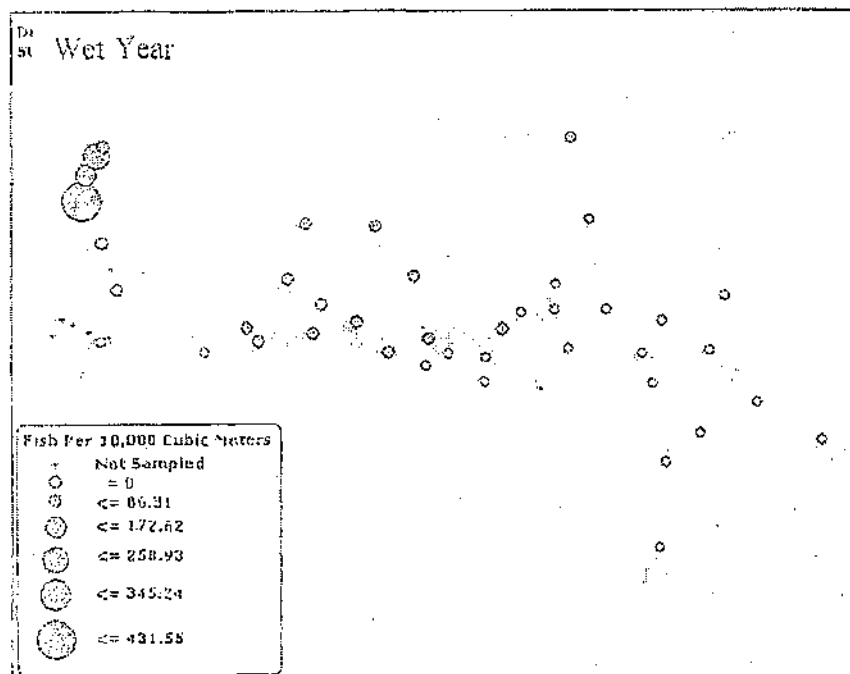
Assumptions:

Pumping rate of 8,000 combined exports

Previous fall midwater trawl recovery index: 45

Potential Actions:

Under this example, with a distribution centered in the central and south Delta and a low previous year's fall midwater trawl index, concern would be high. Particle tracking modeling would likely predict a moderate risk of entrainment at the facilities under these conditions, and a net upstream OMR flow around 0-2000 may be recommended to avoid or minimize entrainment. Another concern would arise if indirect effects of the export facilities resulted in the redistribution of delta smelt into the less productive south Delta. Although the Projects would be expected to entrain relatively fewer fish under this example, extending holding of delta smelt in the poorer habitat conditions in the south Delta would likely be of concern.

Example 3**Hydrology:**

Sacramento River Flow of 80,000 cfs

San Joaquin River Flow of 8,000 cfs

Assumptions:

Pumping rate of 10,000 combined exports

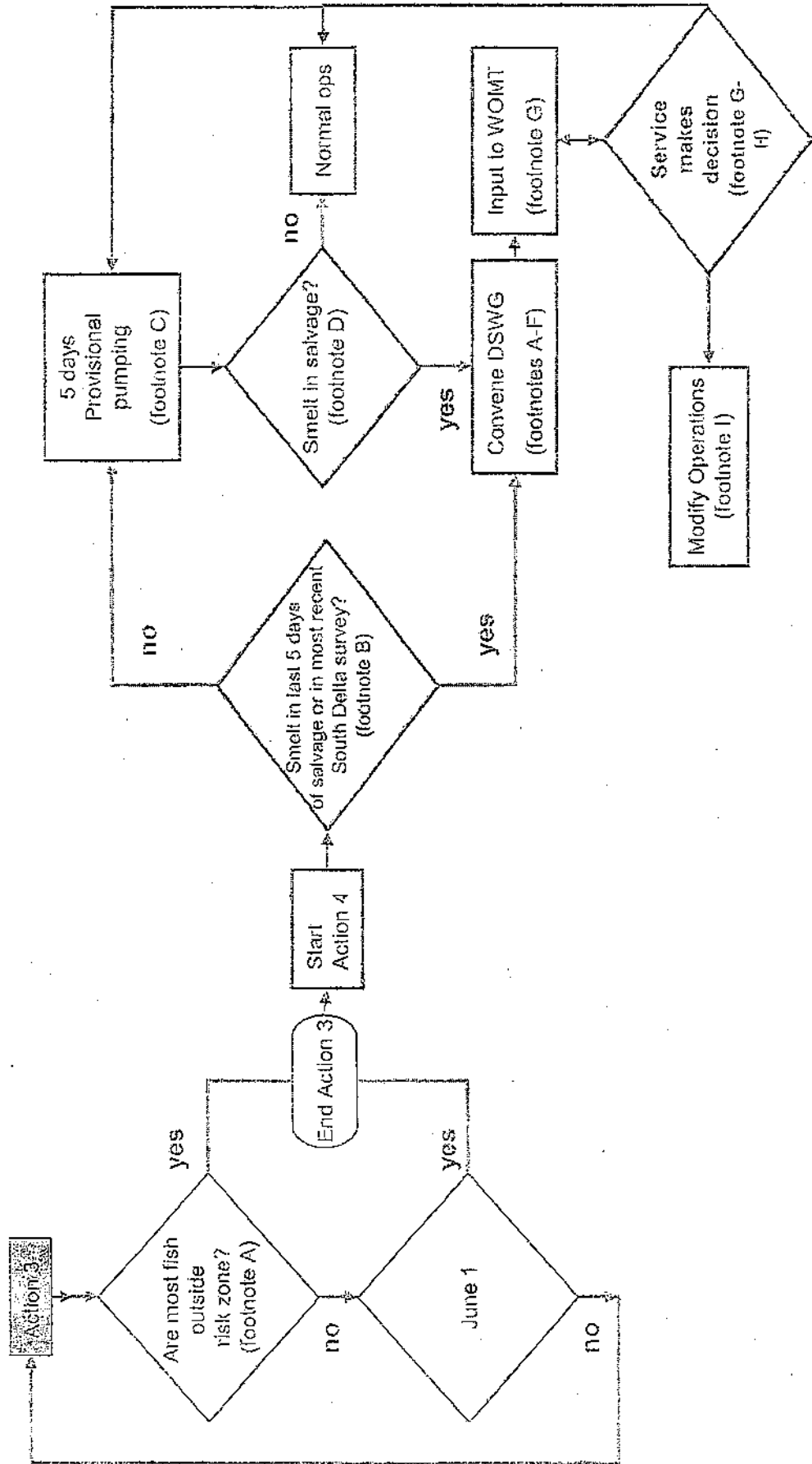
Previous fall midwater trawl recovery index: 45

Potential Actions:

Under this example, with a distribution centered in Suisun Bay and a low previous year's fall midwater trawl index, concern would be low, relative to drier year types. Particle

tracking modeling would likely predict a low risk of entrainment at the facilities under these conditions and a net upstream OMR flow closer to 4,000 may be sufficient to protect delta smelt. Under this example, net upstream flows may be positive due to hydrology, and may end the action.

Attachment B of Exhibit A Process for ending Action 3 and Implementing Action Number 4.



See footnotes on next page

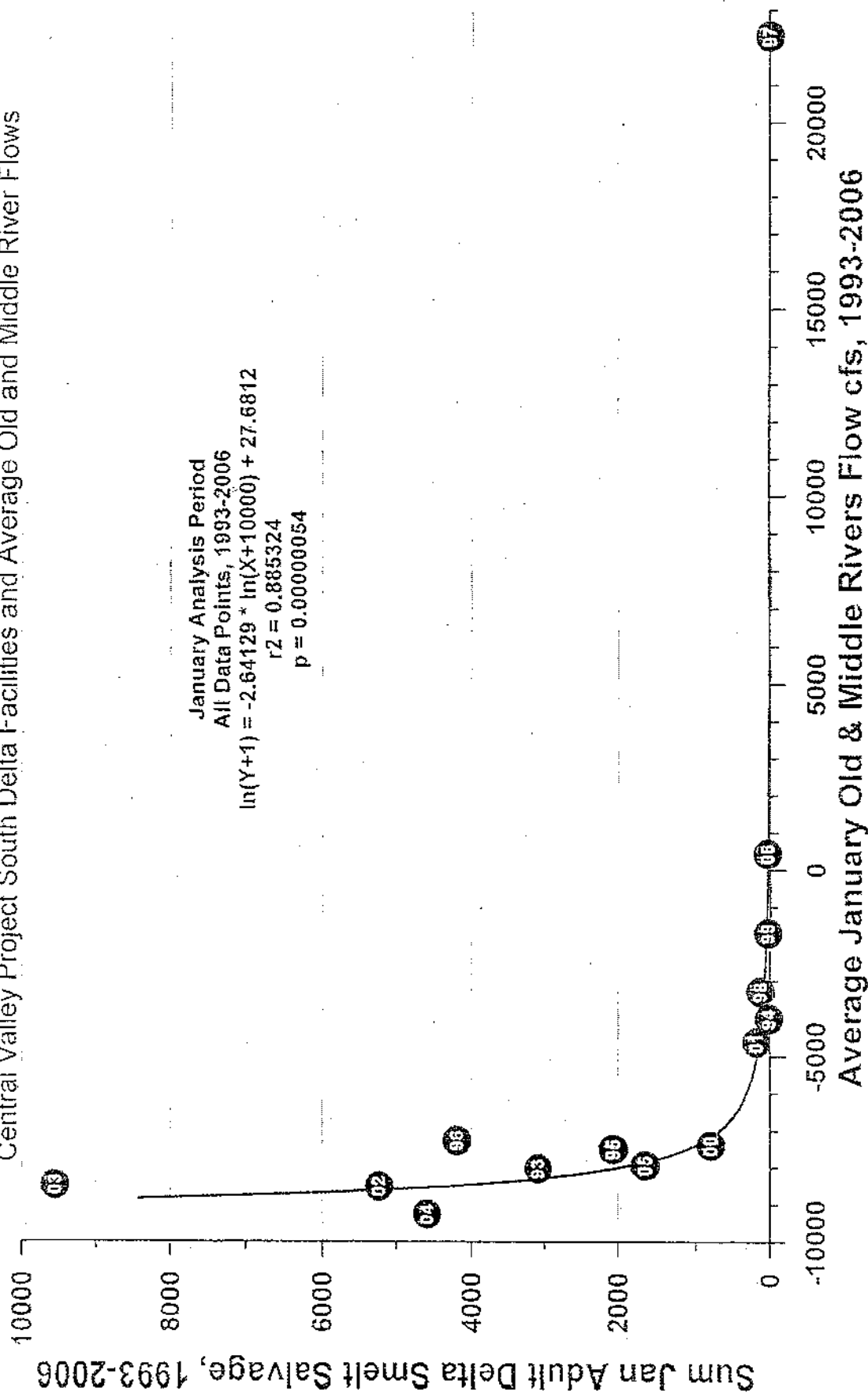
Footnotes for Attachment B of Exhibit A

- A. Particle tracking modeling will be used to estimate the intensity and spatial extent of the water export facilities' hydrological influence within the Delta at expected OMR flows under normal operations (i.e., "estimated risk zone"). Distribution of delta smelt will be estimated by using near real time data from delta smelt surveys, e.g. Spring Kodiak Trawl (SKT) and 20-mm surveys. Overlap between the "estimated risk zone" and the delta smelt distribution will then be used to evaluate potential larvae exposure to entrainment. See examples in Attachment A to Exhibit 2.
- B. Delta smelt occurrence in the salvage or at any south Delta sampling stations for the most recent 20-mm or Summer Townet surveys.
- C. Increased exports would be provisional based on continuing re-evaluation of the data at hand, which are the data evaluated for Action 3.
- D. Observation of one (1) delta smelt in salvage at either water export facility will trigger a meeting of the DSWG.
- E. Using data from surveys, the DSWG will draw preliminary conclusions regarding the relative abundance of delta smelt and their approximate distribution. This information will be used, along with the factors set out in Attachment A to Exhibit 2, to evaluate the potential for adverse effects to the year's delta smelt population from diversions by the projects and develop modifications to the projects' operations as necessary to minimize adverse effects upon the smelt population.
- F. Historically, smelt were not found in the south Delta at surface temperatures above 25.6° C (CDFG). Also, salvage of delta smelt typically drops off after mean size ~40mm FL (based on review of historic 20-mm survey and/or Summer Townet survey data). DSWG will assess conditions using the data generated in the processes outlined in the above notes.
- G. WOMT and Service decision process:
 - a. DSWG provides biological information and analysis of condition of delta smelt to WOMT
 - b. If WOMT agrees with the Service's recommendation, the Project Agencies implement the Service's recommendation. If WOMT does not agree with the Service's recommendation, WOMT will propose an operational response.

- c. In the event of disagreement, the Project Agencies provide additional information about operational constraints to the Service. Any WOMT agency can provide additional information to the Service.
 - d. The Service either concurs with Project Agencies' proposed operations or notifies the Project Agencies that implementation of the Service-proposed modification of operations is necessary to adequately protect the delta smelt.
- H. The Service retains the right to recommend additional actions based on real time conditions.
- I. Operations of the two water export facilities will be modified in a manner similar to what is described in Action 3 of Exhibit 2. Other actions may be taken that are found to appropriately avoid or minimize entrainment effects at the water export facilities.

Exhibit B

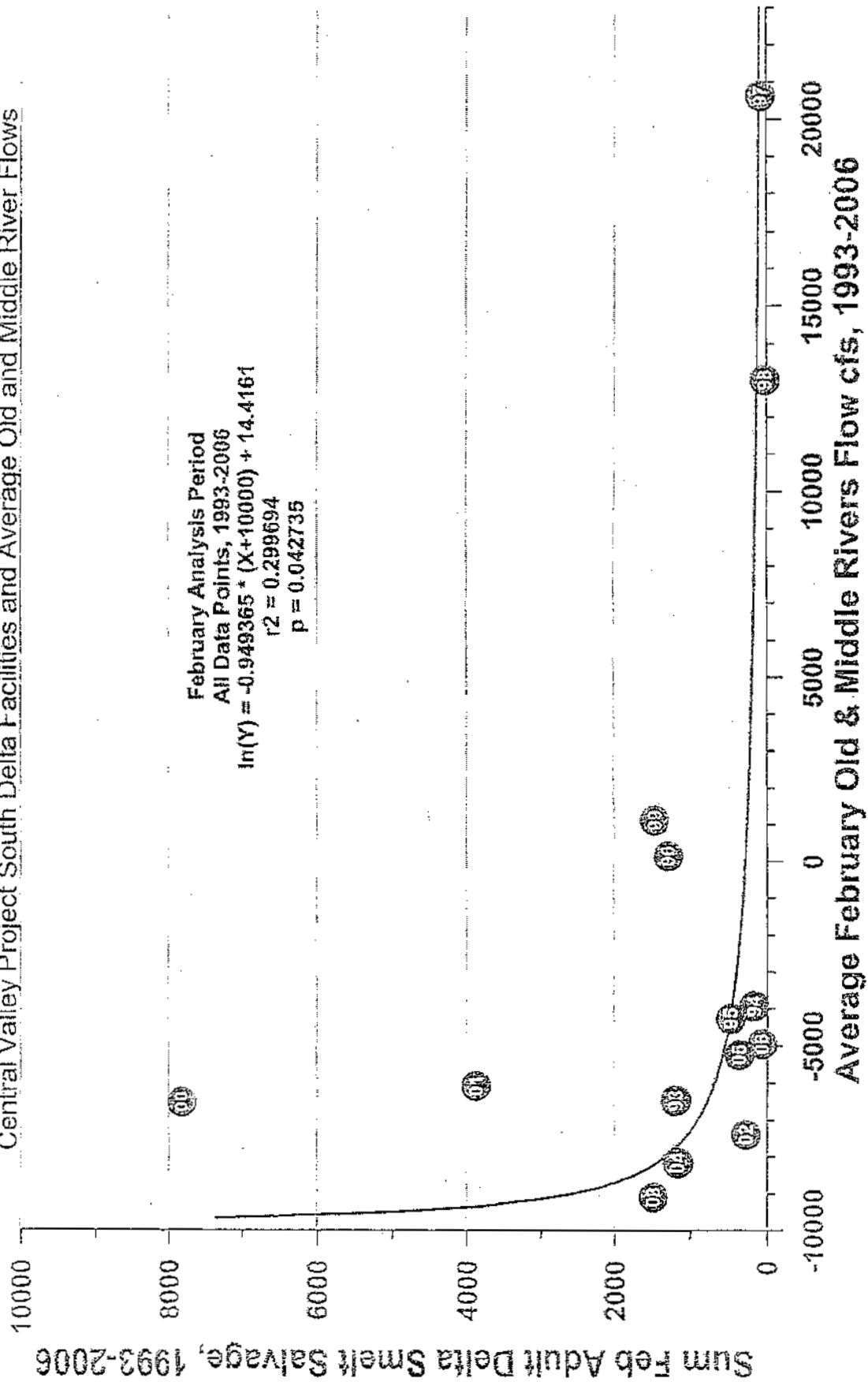
January Total Delta Smelt Salvage at the State Water Project and
Central Valley Project South Delta Facilities and Average Old and Middle River Flows



Notes: Negative numbers indicate net upstream flow.
Prepared by DWR adapted from analysis performed by USGS.

Exhibit C

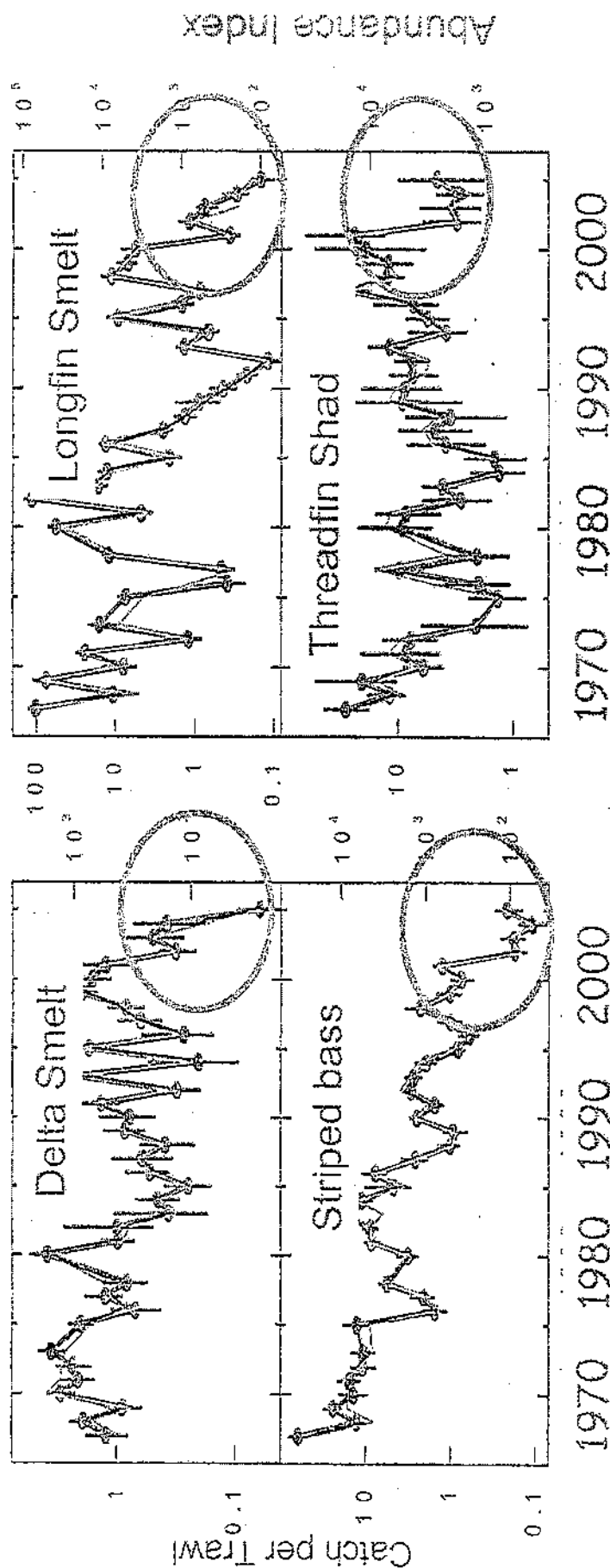
February Total Delta Smelt Salvage at the State Water Project and
Central Valley Project South Delta Facilities and Average Old and Middle River Flows



Notes: Negative numbers indicate net upstream flow.
Prepared by DWR adapted from analysis performed by USGS.

Exhibit D

The Pelagic Organism Decline



Source: Kimmerer and Nobriga (2005); Sommer et al. (In Press, Fisheries 32(6))

Exhibit E

Phytoplankton Primary Production

... CRASHED in
Suisun Bay right
after the 1987
Corbula invasion

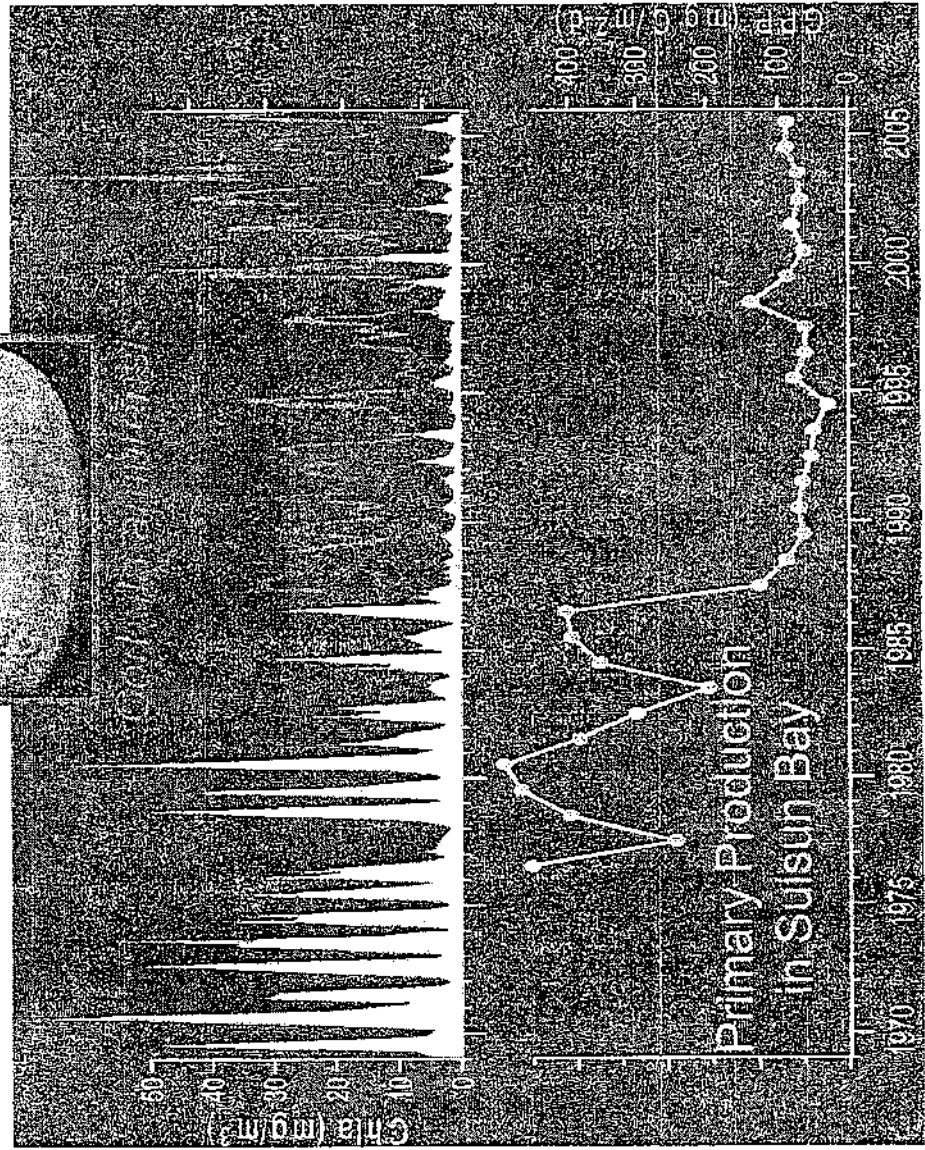
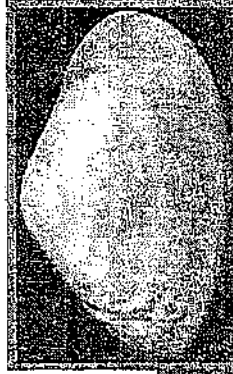
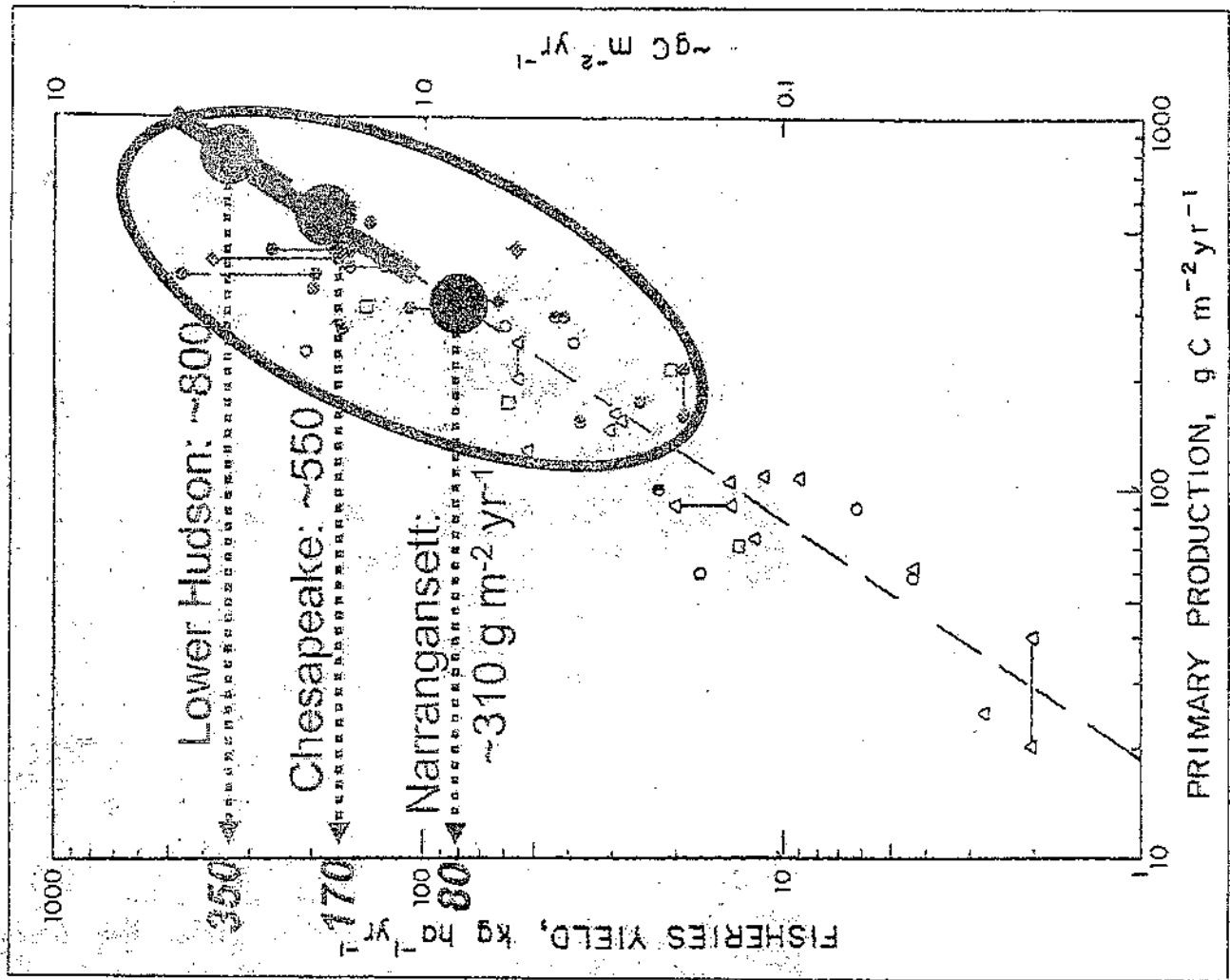


Exhibit F

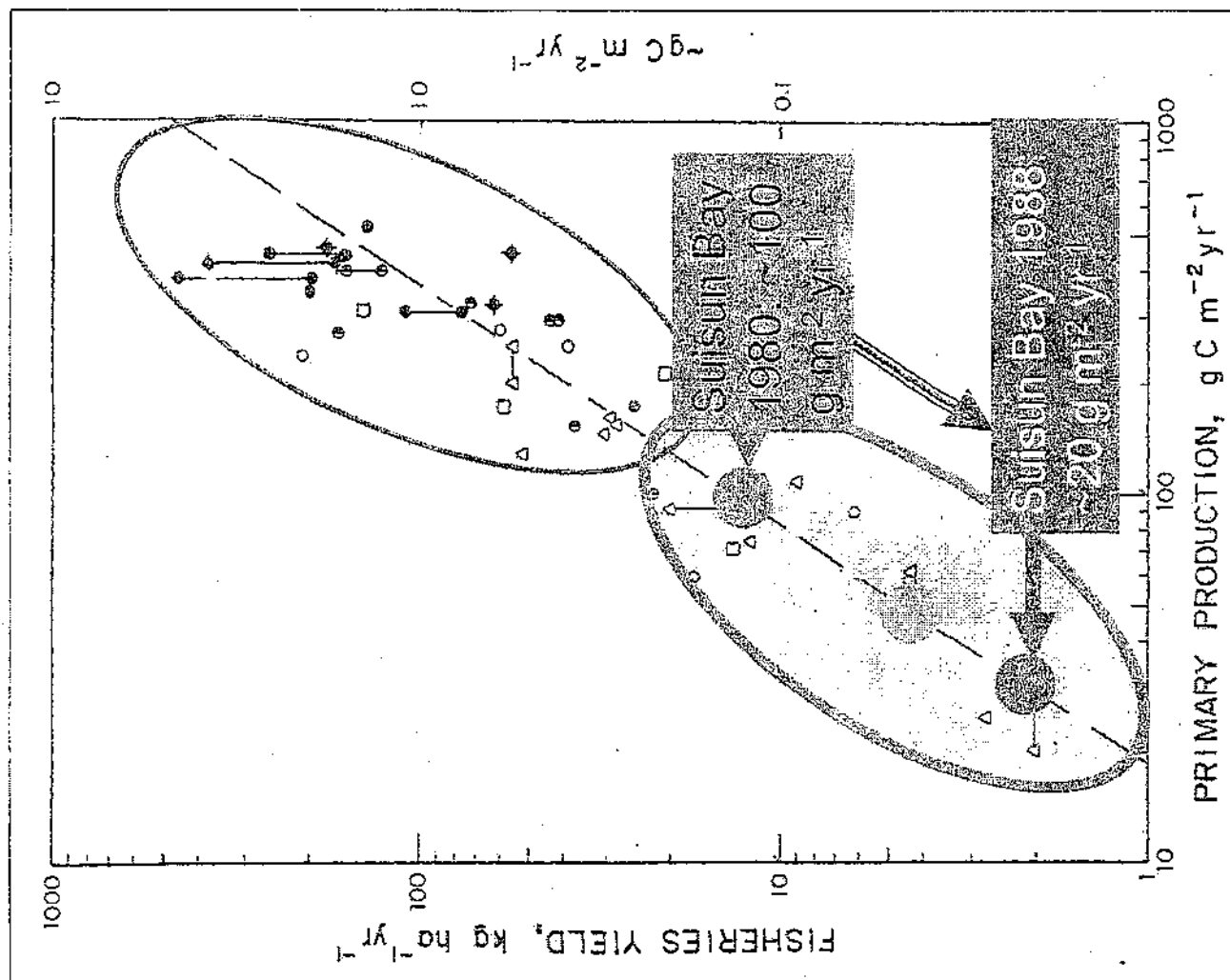
Phytoplankton
Primary Production

... in Estuaries is
typically very HIGH



Source: S. Nixon, Limnology and Oceanography 1988

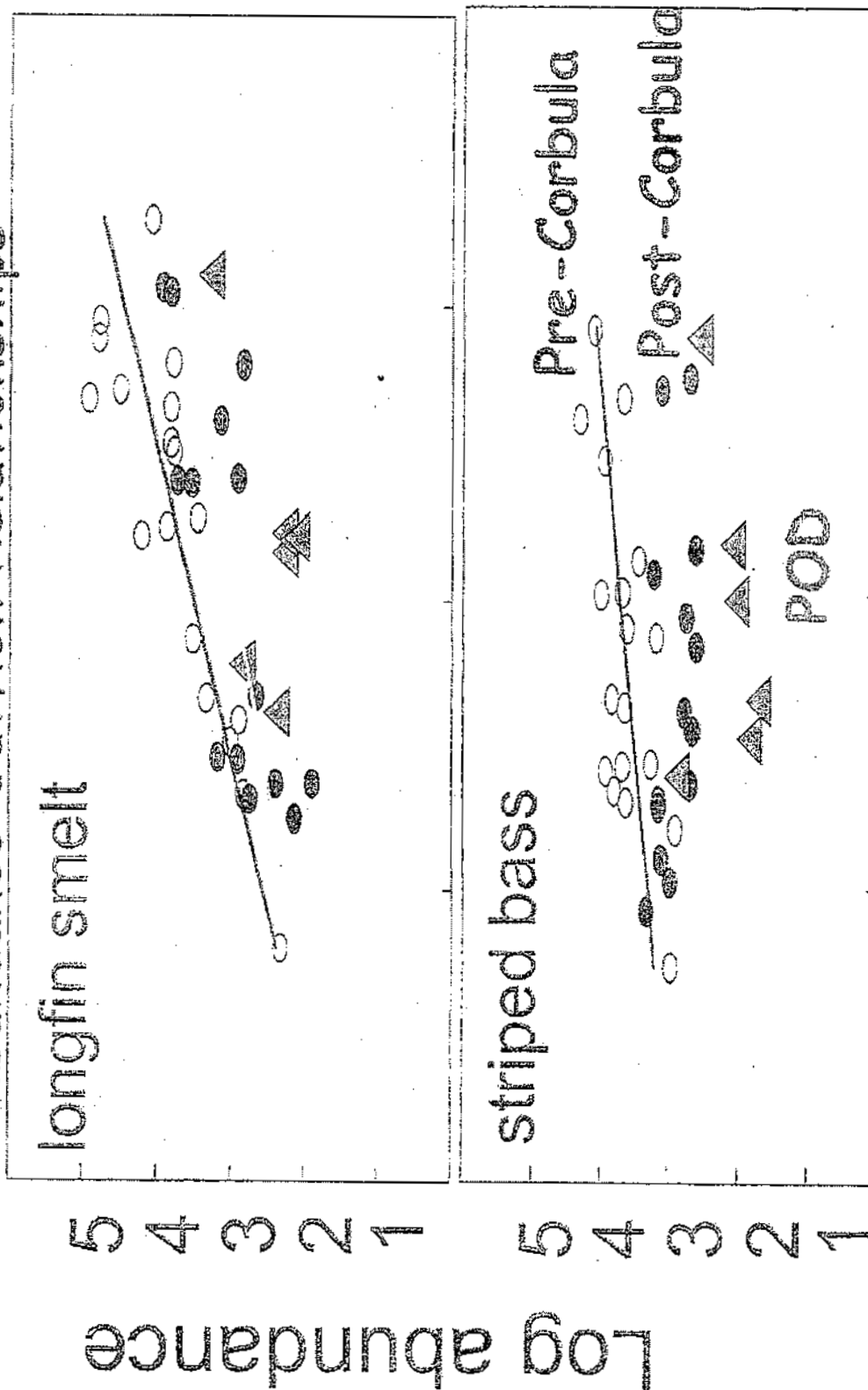
Exhibit G - Phytoplankton Primary Production ... CRASHED in Suisun Bay right after the Corbula invasion



Sources: J. Cloern (USGS) & A. Jassby (UCD): Oral presentations at the 2007 Annual IEP Workshop, Asilomar, CA

Exhibit H

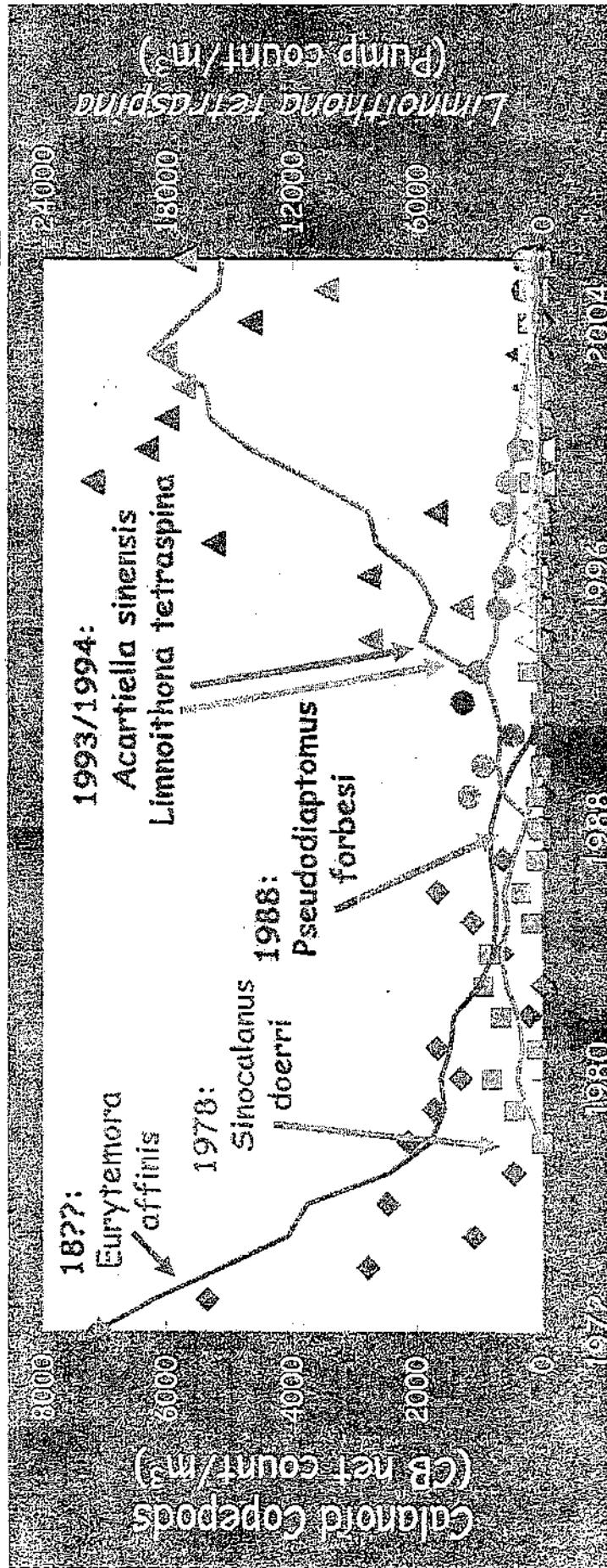
POD Has Further Shifted Abundance-Outflow Relationships



2.0 2.5 3.0
Log Delta outflow

Source: Kimmerer (2002); Sommer et al. (In Press, Fisheries 32(6))

Exhibit I - Zooplankton Species Invade in "Waves"



Adult copepods at Chipps Island, yearly average densities with 5-year moving average lines

Source: A. Mueller-Solger, DWR; IEP data

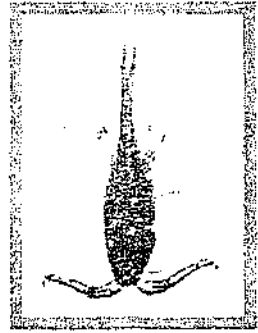
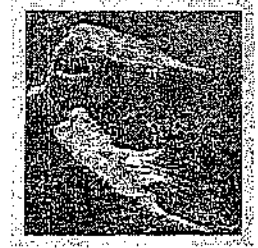
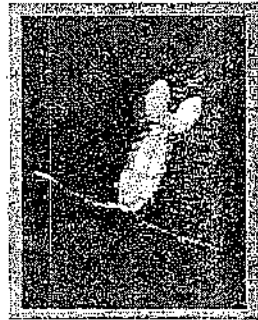
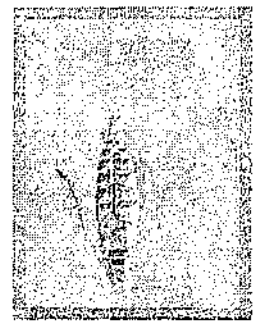
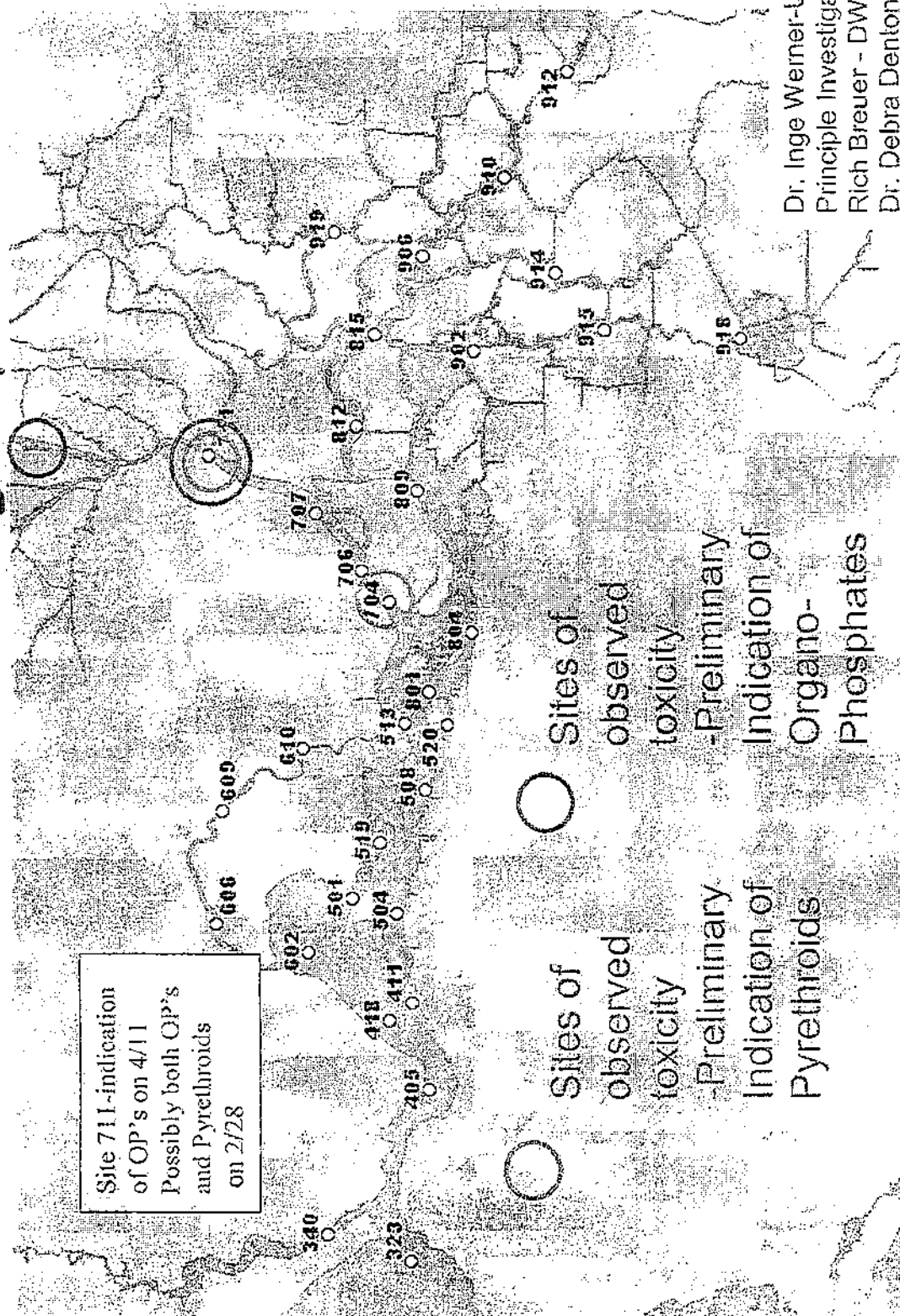


Exhibit J

Synopsis of Toxicity Test Findings

Four Dates Feb through April 2007

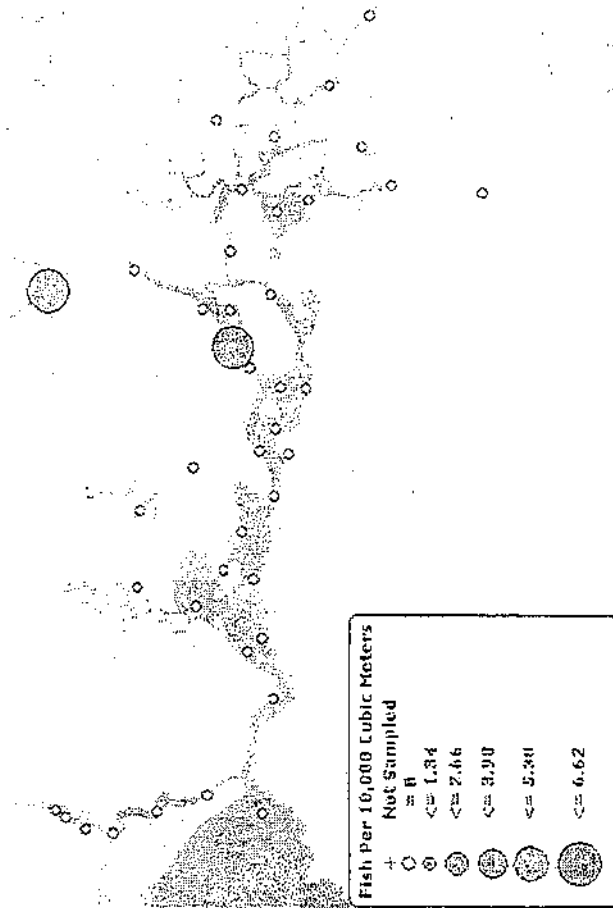


Dr. Inge Werner-UCD-
Principle Investigator
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Dr. Debra Denton-USEPA

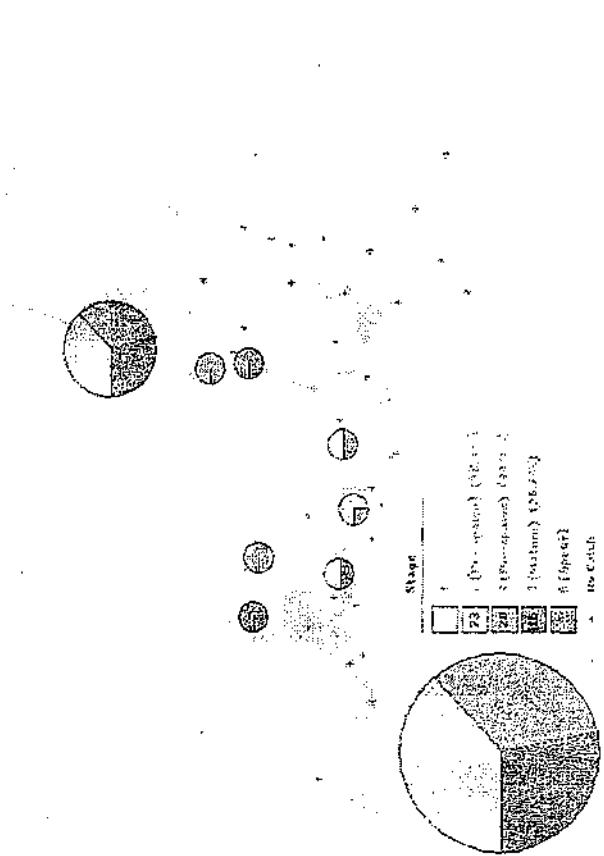
Exhibit K

Distribution of Adult and Young Smelt in April 2007

Delta Smelt 2007
SURVEY 3 (4/5/2007 - 4/14/2007)



Spring Kodiak Trawl Survey #4 of 2007
Distribution of Female Delta Smelt
(4/2/2007 - 4/5/2007)



www.delta.dfg.ca.gov 7/7/2007 9:20:34 PM

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18 **IN THE UNITED STATES DISTRICT COURT**
19 **FOR THE EASTERN DISTRICT OF CALIFORNIA**

20 **NATURAL RESOURCES DEFENSE**
21 **COUNCIL, et al.**

22 Plaintiffs,

23 **DIRK KEMPTHORNE, Secretary, U.S.**
24 **Department of the Interior, et al.**

25 Defendants,

26 **SAN LUIS & DELTA-MENDOTA WATER**
27 **AUTHORITY and WESTLANDS WATER**
28 **DISTRICT; CALIFORNIA FARM BUREAU**
29 **FEDERATION; GLENN-COLUSA**
30 **IRRIGATION DISTRICT, et al.;**
31 **CALIFORNIA DEPARTMENT OF WATER**
32 **RESOURCES, and STATE WATER**
33 **CONTRACTORS,**

34 Defendant-Intervenors.

Case No. 05-CV-01207 OWW (TAG)

DECLARATION OF JERRY JOHNS
IN SUPPORT OF THE
CALIFORNIA DEPARTMENT OF
WATER RESOURCES
INTERIM REMEDY PROPOSAL

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: The Honorable
Oliver W. Wanger

1 I, Jerry Johns, declare as follows:

2 1. I am Deputy Director for the California Department of Water Resources
3 ("DWR"), having been assigned as acting to this position in January 2004 and appointed to it in
4 August 2004. My educational background includes a Bachelors degree in Zoology and a Master
5 degree in Freshwater Ecology from the University of California at Davis.
6

7 2. I was Chief of DWR's Water Transfers Office from June 2001 to January
8 2004. As Chief of the Transfers Office I coordinated many water transfer programs for DWR
9 including the CALFED Environmental Water Account ("EWA") established in 2000. In this
10 position I oversaw the implementation of adaptive management measures that relied on the use
11 of about 320,000 acre-feet of water (termed EWA assets) that enabled DWR and U.S. Bureau of
12 Reclamation ("USBR") to take actions to improve conditions for Delta fish, including delta
13 smelt, beyond the regulatory baseline.
14

15 3. I am familiar with the operations of the State Water Project ("SWP") and
16 have a working familiarity with the Delta operations of the federal Central Valley Project
17 ("CVP"), particularly as they relate to SWP operations. My area of management responsibility
18 includes DWR's participation in the Water Operations Management Team ("WOMT"). The
19 WOMT consists of directors or regional managers who designate management level participants
20 from their agencies of USBR, DWR, U.S. Fish and Wildlife Service ("USFWS"), National
21 Oceanic and Atmospheric Administration National Marine Fisheries Service (NMFS), and the
22 Department of Fish and Game ("DFG"). These representatives meet weekly for purposes of
23 oversight and timely decision-making regarding CVP and SWP Delta operations that must occur
24 in response to real-time fish monitoring and changing Delta hydrology. The WOMT relies on
25 information from technical staff from each of the agencies.
26
27
28

1 4. From 1974 -2001, I was employed at the State Water Resources Control
2 Board ("SWRCB"). During most of that time I either worked on or oversaw the SWRCB's.
3 development of water right decisions and water quality control plans for the San Francisco Bay/
4 Sacramento - San Joaquin Delta (Bay/Delta) including the regulation of the operations of the
5 SWP and the CVP. For 16 years at the SWRCB I was Assistant Chief of the Division of Water
6 Rights where I supervised the development of numerous complex water right decisions and
7 orders throughout California dealing with fishery and water management conflicts including the
8 1994 Mono Lake Decision and subsequent orders.
9

10
11 5. The facts set forth herein are based on my knowledge, familiarity and
12 involvement with the programs discussed herein. All opinions expressed in this declaration are
13 based on my professional judgment. If called as witness, I could and would testify consistently
14 with this declaration.
15

16 DEVELOPMENT OF INTERIM REMEDY PROPOSAL

17 6. I participated with managers and scientists from the DFG, USFWS,
18 NMFS, and USBR to help the USFWS develop actions to minimize and prevent adverse impacts
19 to delta smelt and its habitat from SWP and CVP operations during the interim period pending
20 completion of the consultation on the delta smelt with USFWS. I am informed and believe that
21 the USFWS can complete the consultation and issue its biological opinion before August 2008.
22

23 7. The actions have been developed using the best scientific data available.
24 DWR will do its proportionate share to the extent possible to implement the actions, which
25 consist of adjusting SWP and CVP operations to maintain prescribed flows in the south delta
26 channels of Old River and Middle rivers. The actions are described in the attached Exhibit A, a
27 matrix prepared by USFWS and titled "Delta Smelt Action Matrix for Water Year 2008"
28

1 ("Action Matrix"). The Action Matrix includes footnotes and Attachments A and B that explain
2 specifics of implementing the actions and the scientific basis for the actions.

3 8. During the USFWS consultation, DWR will not make any irreversible or
4 irretrievable commitments of resources that have the effect of foreclosing any reasonable and
5 prudent alternative measures. During this time, DWR will continue SWP operations described in
6 the USFWS 2005 delta smelt Biological Opinion, including the transfer of water for the EWA,
7 that are not inconsistent with the court's orders.
8

9 9. The operations of the SWP and the CVP are separate but interdependent
10 and are coordinated through a federal-State agreement called the "Coordinated Operations
11 Agreement." DWR intends that the proposed Action Matrix will be coordinated with USBR
12 operations because the actions would require changes in export operations by the SWP and CVP
13 to achieve the prescribed flows in Old and Middle rivers. DWR proposes that the water supply
14 impacts of these actions be split equally between the SWP and CVP as has been the recent
15 practice for such mandated changes in combined export operations, or as otherwise agreed upon
16 by DWR and USBR. DWR submits that compliance with the Action Matrix is not a joint and
17 several obligation on the two Projects but is a shared obligation as described above.
18
19

20 OVERVIEW OF ACTION MATRIX

21 10. The Action Matrix includes five actions within a prescriptive framework.
22 Actions 1 and 2 prescribe specific combined flow in Old and Middle rivers. Action 3 and 4
23 prescribe a combined flow that is determined on a real-time basis using survey data of fish and
24 monitoring of Delta habitat and hydrologic conditions. Action 5 prescribes constraints on
25 installation and operation of the fish and agricultural seasonal rock barriers in the south Delta.
26
27

28 11. DWR will use response variables, or performance measures, to help assess

the degree to which the actions produce the intended benefit to delta smelt. These response variables include analysis of the delta smelt salvage at the SWP and CVP south Delta fish facilities, and of data from delta smelt surveys, such as the Fall Mid-Water Trawl and Summer Tow Net, including changes in the size distribution of delta smelt in these surveys. The analysis in future years of the effect of an action based on the response variables can be used to adjust subsequent actions and improve their benefit to delta smelt and to more effectively use the water resources needed to provide the expected benefits of the actions.

DELTA SMELT LIFE HISTORY

12. Delta smelt are slender-bodied, translucent fish that typically grow to 60-70 mm in length from tip of snout to end of tail.¹ Delta smelt typically live for only one year but some can live for two years.² At all life stages they are found in greatest abundance in the top two meters of the water column and usually not in close association with the shoreline, inhabiting open surface water of the Delta and Suisun Bay.³ Critical thermal maximum for delta smelt, the temperature at which smelt can no longer survive as determined by laboratory studies, is 25.4 degrees Celsius (plus or minus 1.7 degrees Celsius).⁴

13. Before spawning, adult delta smelt tend to concentrate in the brackish

¹ USFWS. Feb. 16, 2005. Reinitiation of Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the CVP and SWP and the Operational Criteria and Plan to Address Potential Critical Habitat Issues ("Bio Op"). p. 117; DFG. April 2005. Project Review Guidelines for Delta Smelt, Winter-run Chinook Salmon, and Spring-run Chinook Salmon Protection in the Sacramento-San Joaquin Estuary, p. 11.

² William A. Bennett. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science. Vol. 3, Issue 2 (September 2005); Article 1, p. 1 and 22.

³ <http://repositories.cdlib.org/jmie/sfews/vol3/iss2/art1>

⁴ Bio Op, p. 117.

⁵ Swanson, C.; T. Reid; P.S. Young; and J. J. Cech Jr. 2000. Comparative environmental tolerances of threatened delta smelt (*Hypomesus transpacificus*) and introduced wakasagi (*H. nipponensis*) in an altered California estuary. *Oecologia* 123:384-390, 384.

1 water near where incoming salt water and out flowing fresh water mix (mixing zone). Adult
2 delta smelt move from brackish to fresh waters to spawn. Specific spawning locations and
3 seasons vary from year to year. They usually begin migrating to upstream spawning areas in late
4 December or early January and February. In late February and March, spawning begins when
5 water temperatures reach about 12 degrees Celsius and peaks from 15-20 degrees Celsius.⁵

7 14. Delta smelt lay adhesive eggs that are believed to attach to tree limbs or
8 small rocks. Eggs hatch after 11-13 days and smelt become free-floating larvae. The larvae are
9 difficult to detect with fish sampling gear and are not detectable in the standard fish salvage
10 sampling at the SWP and CVP fish facilities.

12 15. During April, May and June, larval fish increase in size and develop
13 greater swimming ability. They are distributed generally in the western Delta and in Suisun Bay
14 where they are associated with the landward margin of the low salinity zone. Older juveniles are
15 more widely distributed but also maintain an association with the low salinity mixing zone.⁶

17 MONITORING OF DELTA SMELT

18 16. DFG conducts four types of monitoring surveys through the year to
19 determine distribution of juvenile, sub-adult and adult delta smelt. In two cases abundance
20 indexes have been calculated historically. These indexes provide an indication of general trends
21 in smelt abundances over years. The abundance indexes also provide an indication of the year to
22 year trends in the smelt abundances based on the number of fish caught in each survey.

24 17. Two of these monitoring surveys, the Fall Mid-Water Trawl (FMWT) and
25 the Summer Tow Net Survey (STNS), have been conducted since the 1960's. These surveys are
26 done in a consistent manner each year which allows the data to be used to determine trends in the
27

28 ⁵ Bennett, p. 1 and 17; DFG Project Review Guidelines, p. 11.

⁶ DFG Project Review Guidelines, p. 11.

1 relative abundance of delta smelt over the years. However, these indexes should not be confused
2 with actual estimates of the smelt population, which would have to make assumptions about the
3 effectiveness of the sampling gear to capture the fish, the distribution of the smelt in the water
4 column, the volume sampled by the gear at various depths of the water column and other factors.
5 It has been difficult to obtain scientific consensus on these assumptions.
6

7 18. In addition to the surveys, the number of fish salvaged at the SWP and
8 CVP facilities may indicate the presence of smelt in the south Delta channels. However, the
9 SWP has the 31,000 acre-foot maximum capacity Clifton Court Forebay in front of its Harvey O.
10 Banks (Banks) Pumping Plant⁷, while the CVP William Jones (Jones) Pumping Plant and
11 salvage facilities divert directly from the south Delta channels. Therefore, the CVP Jones
12 facilities are a more reliable "sampling devise" of the southern Delta channels than the SWP,
13 especially in June and July as was apparent this year. Delta smelt may spawn in the Clifton
14 Court Forebay or juveniles may move into the Forebay earlier in the year and therefore the
15 juveniles salvaged at the SWP in June and July may reflect those fish already in the Clifton
16 Court Forebay and not those from the south Delta channels.
17

18 19. The surveys and the SWP and CVP delta smelt salvage data are tools used
19 to help assess the effects from the actions in the Matrix and adjust the actions when appropriate.
20

21 Spring Kodiak Trawl

22 20. In the Spring Kodiak Trawl survey, DFG samples adult delta smelt from
23 mid-January into April or May, depending on the time the smelt spawn that year. DFG conducts
24 the survey every other week, taking four to five days and sampling 39 stations (from the Napa
25 River to Stockton on the San Joaquin River, and to Walnut Grove on the Sacramento River). The
26
27
28

⁷ DWR, June 1999, California State Water Project Atlas, p. 76.

1 sampling is done using a standard quantitative method every month. In between the time of the
2 standard quantitative sampling, DFG conducts more intensive sampling in areas where smelt are
3 more populous.⁸ Graphic plots summarizing the relative distribution of adults are posted on the
4 Internet on a real-time basis.
5

6 20-mm Survey

7 21. DFG's 20-mm survey provides information of the distribution and relative
8 abundance of post-larval and juvenile delta smelt at up to 41 locations throughout their historical
9 spring range from March through June or July. The actual number of sampling locations and
10 duration of the survey depend on the spring runoff and timing of spawning in that year. DFG
11 conducts eight to ten surveys that each take six days and are conducted every two weeks. The
12 fish sampling gear is designed to detect juvenile smelt between 20 mm and 50 mm in length.
13 Graphic plots summarizing the relative distribution of the 20-mm surveys are posted on the
14 Internet on a real time basis.
15
16

17 Summer Tow Net Survey (STNS)

18 22. In the STNS, DFG determines relative abundance and distribution of juvenile
19 delta smelt and provides data on the recruitment potential of the species. DFG samples at 31
20 stations six times a year from early June through late August. The STNS provides an abundance
21 index that is considered to be a more representative index than others because the data has been
22 collected over a wide geographic area and for the longest period of time.⁹
23

24 Fall Mid-Water Trawl (FMWT)

25 23. In the FMWT survey, DFG samples late juvenile and adult delta smelt from
26 September through December. DFG surveys 116 locations through the entire delta smelt
27

28 ⁸ DFG Project Review Guidelines, p. 8.

⁹ Id.

distribution range (San Pablo Bay, upstream to Rio Vista on the Sacramento River and to Stockton on the San Joaquin River). The FMWT provides a measure of pre-spawning adult relative abundance and distribution. A FMWT index is calculated based on pre-spawning adults and provides an estimate for delta smelt stock and recruitment.¹⁰

Delta Smelt Salvage at SWP and CVP Fish Facilities

24. DFG monitors the salvage of delta smelt at the SWP and CVP fish screening facilities. During this process, periodic sampling is conducted to quantify the total number of fish salvaged each day. Salvage of adult smelt typically occurs January through March and salvage of juveniles larger than 20 mm typically occurs May into July. Once delta smelt near 20 mm in length they are detectable in the fish salvage. In the summer and fall delta smelt reside in the saltier, cooler water of the western Delta and Suisun Bay as they grow into adults.¹¹

DESCRIPTION OF MATRIX ACTIONS 1 through 5

Action 1 – Winter Pulse Flow And Adult Spawning

25. Actions 1 through 4 of the Matrix will require changes in export operations by the SWP and CVP. These changes will lessen or avoid net upstream Old and Middle river flows. The SWP and CVP have reservoirs north of the Delta. The movement of this water across the Delta and its diversion at the SWP and CVP south Delta facilities can change the net daily direction of flow in Old and Middle rivers. This flow reversal can occur when the San Joaquin River flow is low, Delta hydrologic conditions favor a southerly flow, and in-Delta diversions are high. Scientists from the U.S. Geological Survey ("USGS") and DWR analyzed historical Old and Middle rivers flow rates and salvage in January and February. They found a statistical relationship in flow and salvage indicating that controlling net flow in the Old

¹⁰ DFG Project Review Guidelines, p. 9.

¹¹ Id.

1 and Middle rivers may reduce entrainment of delta smelt at the SWP and CVP pumps, as cited in
2 Footnote 5 of the Action Matrix.

3
4 26. Action 1 is designed to reduce the number of adult smelt migrating into
5 the south Delta to spawn where they and their progeny have a high risk of being entrained. The
6 Action is based on the observation that adult delta smelt salvage typically begins after the first
7 large storm event in the basin in or after late December. This pulse of fresh water, the turbidity
8 that it carries into the Delta or some other factor or factors closely associated to the flow pulse
9 appear to stimulate the movement of the adults to upstream spawning areas. Adult delta smelt
10 are associated with turbid water: they are never found during the surveys in clear water. As the
11 adult smelt migrate upstream they may follow this turbidity as it flows towards the south Delta
12 pumps and become dispersed in the central and southern Delta where they become more
13 susceptible to entrainment by the SWP and CVP. The conceptual model for this action was
14 developed by scientists in the Delta Smelt Working Group and Dr. Mike Chotkowski of USBR,
15 as explained in Footnote 4 of the Action Matrix.

16
17
18 27. Action 1 proposes reductions in SWP and CVP pumping in winter over a
19 10-day period after the first pulse flow to reduce movement of adult smelt into the central and
20 southern Delta. The action would be triggered on or after December 25 based on when turbidity
21 reaches a threshold at specific locations. The threshold is measured by a scientific method using
22 Nephelometric Turbidity Units (NTU). The action is for ten days to allow the turbidity plume to
23 pass out of the Delta and hopefully not disperse within the central and southern Delta. This
24 action may help shift the distribution of adult delta smelt into the classically more turbid
25 Sacramento River system, where they would be less vulnerable to entrainment.

26
27
28 28. The action is not begun if there are high enough flows on the

1 Sacramento River System at Freeport to move adult smelt into Suisun Bay away from the effects
2 of the SWP and CVP (flow measures as a 3-day average of greater than 80,000 cfs).

3 29. The action ends when there is high Freeport flow, delta smelt
4 spawning begins, or water temperatures reach 12 degrees Celsius. Footnotes 2 and 3 of the
5 Action Matrix define when the onset of spawning occurs and the method to measure
6 temperature. Spawning is known to typically begin when water temperatures become 12 degrees
7 Celsius.
8

9 Action 2 - Adult Salvage Minimized
10

11 30. Action 2 is designed to maintain flows in Old and Middle rivers that
12 create protective habitat conditions for adult delta smelt, or induce their movements into
13 channels of the lower Sacramento River, where the smelt are substantially less at risk of
14 entrainment at the SWP and CVP south Delta pumps. This Action would protect adult delta
15 smelt during January, February, and possibly March, depending on when spawning begins.
16 Spawning typically occurs when water temperatures reach 12 degrees Celsius.
17

18 31. Similar to Action 1, Action 2 is not needed if the flows in the
19 Sacramento River are high enough to push the delta smelt into Suisun Bay. Therefore, the action
20 is not begun or it ends if the 3-day average flow on the Sacramento River at Freeport exceeds
21 80,000 cfs. Action 2 ends if spawning begins or the water temperatures reach 12 degrees
22 Celsius, at which time Action 3 begins.
23

24 32. Action 2 requires changes in SWP and CVP operations to maintain a
25 net upstream flow towards the SWP pumps on Old River and Middle river that will not exceed a
26 14 day running average of 4500 cfs. A 7-day running average that does not exceed 5000 cfs is
27 also required to maintain consistent Project operations and prevent wide fluctuations from the
28

1 target flow. The averaging period begins on the initiation of the action. On the 7th day, the 7-
2 day average is calculated from the preceding 7 days. It is recalculated each day in 7 day rolling
3 blocks moving forward in time. On the 14th day the 14-day average is calculated from the
4 preceding 14 days. It is recalculated for each day in 14 day rolling blocks moving forward in
5 time until the end of the action.
6

7 33. The averaging periods of 14 days and seven days are needed to
8 account for the natural tidal action in the Bay/Delta Estuary. The Bay/Delta Estuary is a tidal
9 body of water where tides can exert large influence over the instantaneous magnitude and
10 direction of water flow. There are two high (flood) and two low (ebb) tides each day. In
11 addition, the lunar cycle (28 days) affects the magnitude of these tides and cause the filling and
12 draining of the Delta with water beyond the mean tidal volumes. The Delta experiences two
13 spring tides (filling tides) and two neap tides (draining tides) each month. One spring/neap cycle
14 takes 14 days. In addition to the effects of the sun and moon, the tides are sometimes affected to
15 a greater degree by meteorological conditions such as winds, barometric pressure, and storm
16 surges. Compliance with measured flows in the Delta must take into account these natural tidal
17 cycles and meteorological factors which overwhelm water project operational changes on a daily
18 basis. Delta hydrodynamics is complex and mathematical models have been developed and are
19 continued to be refined to assist in understanding these hydrodynamic effects on salinity and fish
20 movement. However, professional judgment is necessary when applying these results to
21 biological systems.
22

23 34. As discussed above in paragraph 25, this action is based on analysis by
24 USGS and DWR of the relationship of Old and Middle rivers flow to delta smelt salvage. As
25 noted in Footnote 5 of the Action Matrix, the USGS found a relationship between the winter
26

upstream flow in Old and Middle rivers and the salvage. DWR has found a more robust relationship when the data is analyzed for each month, especially for January and February, as shown Exhibits B and C. The graphs in these Exhibits demonstrate that as upstream flows exceeds 6,000 cfs in Old and Middle rivers, the salvage of delta smelt can significantly increase. The inflection point on the curve in the graph of salvage and Old and Middle rivers flow is between 6000 and 7000 cfs. The shape of the curves for January and February are similar but the predictive power of the February curve is less than January. Therefore, maintaining Old and Middle rivers upstream flow to less than 5000 cfs throughout the winter adult period would be expected to minimize adult smelt entrainment and salvage.

Action 3 - Larval and Juvenile Protection

35. Action 3 is intended to benefit larval and juvenile delta smelt during the spring. It is similar to Action 2 in that flows are prescribed for Old and Middle river and the 14-day and 7-day running averages are used in measuring the flow. The prescribed Action 3 net upstream Old and Middle rivers flow is targeted at a typical range of zero to 4000 cfs. The Action 3 prescribed flow allows some flexibility in the targeted flow based on real-time monitoring data, as explained below.

36. The scientific basis for the flows on Old and Middle rivers to protect larval and juvenile smelt is similar to that described for adults in Action 2. Because the action is to benefit larval and juvenile smelt, however, it is also based on recent analyses by Dr. Bennett of the U.C. Davis Bodega Marine Lab. Dr. Bennett's analyses indicate that adult smelt recruiting to adult population as detected in the FMWT survey (based on back-calculated birthdates) over the last few years mostly originated from cohorts hatched during the Vernalis

1 Adaptive Management Program (VAMP) or low export periods.¹² VAMP is a period of
2 controlled San Joaquin River flow and reduced SWP and CVP exports that occurs mid-April to
3 mid-May. Delta smelt cohorts that would have originated from periods outside of the VAMP
4 period are not being detected in the FMWT surveys. Dr. Bennett's hypothesizes that these early
5 cohorts were entrained by the exports and subsequently lost from the population. Typically
6 exports are high during the period prior to VAMP. The Action 3 flows are intended to help
7 protect these early larvae and juveniles as well as later cohorts.
8

9
10 37. Action 3 will be implemented during March, April, and May,
11 Beginning with the onset of spawning (also defined by a temperature criteria of 12 degrees
12 Celsius) and ending when the risk of entrainment is abated or by June 1, whichever is earlier.
13 USFWS determines if the risk of entrainment is abated and the Action can be ended by following
14 the process described in Attachment B to the Action Matrix.
15

16 38. As described in the Action Matrix and Attachment A of the Matrix, the
17 target flows on Old and Middle rivers will be determined based on real-time data estimating
18 spawning distribution and the susceptibility of a substantial portion of the delta smelt population
19 to the effects of SWP and CVP. The survey data showing distribution and relative abundance of
20 delta smelt from the Spring Kodiak Trawl and the 20-mm Survey will used to estimate spawning
21 and juvenile delta smelt distribution. The Particle Tracking Model (PTM) that uses real-time
22 data will help determine susceptibility of the smelt to SWP and CVP operations on a real-time
23 basis. Attachment A provides some hypothetical examples of implementing Action 3 to
24 demonstrate how the process in Attachment A will determine the prescribed Old and Middle
25 rivers flow. A more robust method may be developed using PTM results during the year.
26
27

28
¹² Dr. Bennett's presentation can be found at
<http://science.ca/water.ca.gov/workshop/ewa.shtml>.

1 39. The PTM is a computerized model of the Delta river system that is
2 used to evaluate the movement of particles in the Delta channels. The PTM shows the
3 movement over time of computer-generated particles that are inserted at specific locations in the
4 modeled channels. The PTM is used to simulate the movement of turbidity or other free floating
5 particles in the water like young larval smelt. The PTM simulations of particle movements help
6 estimate how changes in SWP and CVP pumping operations affect delta smelt movement
7 through Delta channels. Since young delta smelt act less and less like free floating particles as
8 they grow older, the PTM likely overestimates the effects of the SWP and CVP operations on
9 delta smelt.
10
11

12 Action 4 -- Juvenile Protection

13 40. Action 4 will continue protections of juvenile delta smelt in the same
14 manner as Action 3 based on delta smelt surveys and real-time monitoring of delta conditions.
15 An evaluation of real-time data used to determine the prescribed Old and Middle rivers flow will
16 begin on May 15. This evaluation for implementing Action 4 is described in Attachment B of
17 the Action Matrix. Action 4 begins on June 1 and ends when USFWS determines the risk of
18 entrainment of juveniles has been abated, as described in Attachment B.
19
20

21 41. Historical records show that juvenile delta smelt have been salvaged at
22 the SWP and CVP facilities in June. Real-time monitoring will be used as described above in
23 Action 3 to determine Old and Middle rivers flow needed to protect juvenile smelt from the risk
24 of entrainment. However, Action 4 also considers other factors affecting smelt at this time,
25 including rising water temperatures in the southern Delta and local Delta diversions that could
26 capture delta smelt even if the SWP and CVP stopped pumping.
27
28

Action 5 – Head of Old River Barrier and Agricultural Barriers

42. Action 5 requires that DWR not install the Head of Old River Barrier (HORB) in the spring. It also requires that DWR open the tidal flap gates on rock barriers installed by DWR each spring to increase channel water elevations in the south Delta to benefit agricultural diverters. This Action will occur during the time with the Vernalis Adaptive Management Plan (VAMP) is occurring, a period of 31 days from about mid-April to mid-May.

43. The basis for Action 5 is from PTM data. PTM data shows that when the HORB is installed, the CVP and SWP pumping of exports draws more water from Old and Middle rivers than from the San Joaquin River.

44. The HORB forces a greater proportion of the San Joaquin River water to remain in the main stem of the San Joaquin River. Without the barrier, about 55% of the San Joaquin River naturally flows into Old River. In the spring, from about mid-April to mid-May, DWR installs the HORB as part of the VAMP, a study testing the combined affects of the HORB, prescribed San Joaquin River flows, and CVP/ SWP exports. The VAMP is intended to evaluate how these factors effect the downstream migration of Chinook salmon smolts.

45. Typically, juvenile smelt salvage is higher when the HORB is installed when exports are high. The removal of the HORB would increase the proportion of San Joaquin River flowing into Old River and improve conditions to decrease smelt entrainment.

STRESSORS IN THE DELTA AFFECTING DELTA SMELT

46. In early 2005, the Interagency Ecological Program (IEP) scientists first brought to the attention of the DWR, DFG, USFWS, NMFS, and USBR, a decline in abundance indices during the last few years of four pelagic fish species. This decline in delta smelt, long fin smelt (both native species), striped bass and threadfin shad (both introduced species) is

demonstrated by data from the DFG Fall Mid-Water Trawl survey. Exhibit D shows graphs of survey data of the four species from 1967 to 2006, with the left vertical axis showing catch per trawl and the right vertical axis showing the FMWT abundance index. The graphs show the steep decline beginning in 2001 of these species.¹³

47. In 2005, DWR and the other IEP agencies initiated extensive and expensive studies to determine causes for the changes in pelagic fish abundance. This work to study the changes is referred to as the Pelagic Organism Decline Investigation (POD).

48. As part of the POD, factors, referred to as stressors, are being investigated to determine the possible cause of the decline in delta smelt. Besides the effects from SWP and CVP operations, invasive species and toxics in the Delta are believed to be major stressors on delta smelt. The probable interaction of the multiple stressors affecting delta smelt emphasizes the need for a holistic approach to protect Delta species. This approach should be based on an understanding of these major stressors.

Invasive Species

49. The Asian clam *Corbula* is an invasive species that became established in Suisun Bay in the 1980s. This clam feeds by filtering water through its system. The clam's filtering is so effective it appears to be effecting primary production of phytoplankton in Suisun Bay. Exhibit E shows the change in primary production in the Suisun Bay (shown as Chlorophyll A (Chl -A) on the left axis) compared to the time in 1987 when the population of

¹³ Exhibit D is Figure 4 from the article "The collapse of pelagic fishes in the upper San Francisco Estuary" by Sommer, T., C. Armor, R. Baxter, R. Breuer, L. Brown, M. Chotkowski, S. Culbertson, F. Feyrer, M. Gingras, B. Herbold, W. Kimmerer, A. Mueller-Solger, M. Nobriga, and K. Souza. 2007. Fisheries 32(6): In press.

1 *Corbula* increased in the Bay (shown on the right axis as number of clams per square meter).¹⁴

2
3 50. Studies of primary production in other estuaries compared to
4 the Suisun Bay helps to understand the concern over the clam's introduction. Exhibit F from the
5 USGS shows the relationship between primary production and fisheries yield in three estuaries,
6 the Hudson, Chesapeake, and Narragansett.¹⁵ The line graph in Exhibit F shows that as primary
7 production (i.e., the amount of Carbon "C" representing primary productivity per square meter)
8 in a year on the horizontal axis decreases, the yield in fisheries declines (i.e., the weight of the
9 fish yield per year) as shown on the vertical axis. Exhibit G shows a similar graph of fisheries
10 yield compared to primary production in the Suisun Bay. The large solid circles labeled with
11 dates of 1980 and 1988 shows the reduction in the primary production in the Bay during this
12 time. The change in annual productivity from about 100 grams per square meter in 1980 to
13 about 20 grams per square meter in 1988 represents an 80 percent reduction. Comparing the
14 estuaries in Exhibit F to Suisun Bay in Exhibit G shows that primary productivity of Suisun Bay
15 is about five to ten percent of that of the Chesapeake and lower Hudson estuaries. The rapid
16 growth in the population of *Corbula* in Suisun Bay may explain the reduction in primary
17 production. The Bay-Delta's decline in pelagic fish abundance could be related to this dramatic
18 reduction in primary production.
19
20
21

22 51. We see this kind of decline in two representative pelagic fish
23 for which we have the longest historical record in the Bay/Delta system. This kind of change
24

25
26 ¹⁴ Exhibit E is a figure from a presentation given on 3/1/2007 at the Annual IEP Workshop in
Asilomar, California, by James Cloern USGS.

27
28 ¹⁵ This figure is modified from Figure 6 in Nixon, Scott W. 1988. Physical energy inputs and the
comparative ecology of lake and marine ecosystems. *Limnology and Oceanography* 33(4, part
2): 1005-1025.

could be an indication of similar affects for other pelagic fish including delta smelt. Exhibit H shows the change in the historic relationship between the abundance indexes of long-fin smelt and striped bass and amount of water flowing out of the Delta (Delta Outflow). Historically there was a fairly good relationship between Delta Outflow and the abundance indexes of these two pelagic fish. The higher the Delta Outflow, the higher the abundance index. This relationship has been used in the past to justify the development of standards by the State Water Resources Control Board to protect these flows and provide protection to these fish species and other pelagic fish. As seen in Exhibit H this relationship shifted downward after the introduction of *Corbula* showing that Delta Outflow has less affect on improving these indexes than it did before *Corbula* was introduced. It also shows another shift downward in the POD years indicating that another shift in historic relationships has occurred recently to the point that there is no longer a reliable relationship between changes in Delta Outflow and abundance indexes for these two representative pelagic fish species. Whether this is due to the continued invasion of *Corbula* into the Bay/Delta Estuary in either numbers or extent, or some other factor has yet to be determined. The continued decline in these historic relationships between outflow and pelagic fish abundance is another example that the Bay/Delta Ecosystem is changing. Ecosystem changes are affecting pelagic fish abundance, likely including delta smelt.

52. In the late 1990s a new zooplankton *Limnithona* invaded the estuary and quickly became the most abundant zooplankton in the estuary. Exhibit I shows graphs and pictures of different zooplankton that live in the Bay-Delta.¹⁶ The bottom picture on the far right

¹⁶ Exhibit H is a figure produced by Anke Mueller-Solger, DWR, with data collected by the IEP Environmental Monitoring Program. These data are available upon request from April Hennessy, DFG, AHennessy@dfg.ca.gov.

1 is of the new zooplankton *Limnoithona*. Above the pictures is a line graph showing the
2 introduction and increase of *Limnoithona* beginning about 1994. From 1994 the line steeply
3 rises, to the right, and peaks in 2003 with over 15,000 counted, as shown on the right vertical
4 axis. The *Limnoithona* population is replacing other zooplankton that have been the food source
5 for delta smelt. *Limnoithona* does not appear to be a good food source for many important
6 pelagic fish like delta smelt and the replacement of the prior zooplankton with *Limnoithona* may
7 be affecting delta smelt survival.
8

9
10 53. There are a host of additional invasive species that are affecting the
11 Bay Delta Estuary including introduced fish, invertebrates, aquatic weeds and blue-green algae.
12 They all play a role in upsetting the natural ecological functioning of the Delta that could be
13 factors in the decline of the pelagic fishes in this system.
14

15 Toxics

16 54. Since 2005, scientists as part of the POD investigation, have conducted
17 toxicity tests of Delta water. This is done by taking large volumes of water samples from various
18 locations in the Delta and Suisun Bay and placing test organisms in these samples to screen for
19 evidence of toxicity. This type of toxicity testing is known as bioassay. If toxicity is found, then
20 a series of chemical tests are conducted to identify the likely compounds that could be
21 contributing to this toxicity. In the above average water years of 2005 and 2006 the bioassays
22 did not find evidence of reduced survival in the test organisms from Delta samples.
23

24 55. In January 2007, a hydrologically dry year, Dr. Inge Werner, UCD's
25 Principle Investigator, conducted bi-weekly sampling and aquatic toxicity testing. Dr. Werner's
26 2007 testing indicated evidence of toxicity to an aquatic invertebrate exposed to waters taken
27
28

1 from several locations in the Sacramento River portion of the Delta at four times in February
2 though April 2007. Exhibit J shows the sites where the water samples showed evidence of
3 toxicity in Cache Slough (circle at top of map), the Sacramento River Deep Water Ship Channel
4 and the lower Sacramento River near Sherman Lake (circles at number 711 and 704).
5

6 56. Also in 2007 the WOMT agencies took actions in winter and spring
7 similar to those in the USFWS matrix of actions discussed above. The actions were taken to
8 encourage adult delta smelt to stay in the Sacramento River system and away from the central
9 and southern Delta where they are more susceptible to the effects of SWP and CVP operations.
10 Exhibit K shows results of the DFG Spring Kodiak Survey #4, initiated on April 2, 2007, and the
11 distribution of pre-spawning adult females in Cache Slough and the Sacramento River. Exhibit
12 K also shows results of the 20 mm survey #3, initiated April 9, 2007, and the distribution of
13 juveniles in the same areas.
14

15 57. The April 2007 Surveys show distribution of spawning and juvenile
16 smelt in areas where Dr. Werner found toxicity. These are the locations where most of the adult
17 smelt congregated to spawn in 2007 and where most of the young were found but in very low
18 numbers. The toxicants involved are still being evaluated but they are within the class of
19 pesticides known as organophosphates and pyrethroids. Both are used as a dormant spray on
20 trees. These chemicals can either directly affect delta smelt or their food sources.
21
22

23 58. Even though the number of adult delta smelt this year was a little
24 larger than last year (as shown by the FMWT survey indices), the number of young smelt
25 collected this year was about one-tenth the number of those collected last year (as shown by the
26 20 mm surveys). This dramatic drop in Juvenile smelt was a great concern to DFG and USFWS
27 this year and heightened their concern about any further impacts to this reduced population this
28

1 year.

2 59. The toxicity seen in the Delta this year in the areas where adult smelt
3 spawned and where the early life stages of smelt were feeding and growing could have caused
4 direct mortality to smelt or affected their food availability this year and thus contributed to
5 increased mortality of juvenile smelt. Such effects, if not corrected, could occur in the future
6 thus rendering any actions by this court to improve the conditions for delta smelt ineffective.
7

8 CONCLUSION

9 60. Based upon the above, it is my professional opinion that if the Action
10 Matrix as described is adopted by this court and the actions are adaptively implemented, the
11 operation of the SWP and CVP during the consultation will not likely jeopardize the continued
12 existence of the delta smelt or adversely modify its critical habitat. Furthermore, the proposed
13 remedy will not result in any irreversible or irretrievable commitments of resources that have the
14 effect of foreclosing any reasonable and prudent alternative measures and DWR will continue
15 SWP operations as described in the 2005 delta smelt Biological Opinion that are not inconsistent
16 with the court's orders.
17

18 I declare under the penalty of perjury under the laws of the State of California that the
19 foregoing is true and correct.
20

21 Dated:

22 July 9, 2007

23 JERRY JOHNS
24
25
26
27
28